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PROGRAM AND ABSTRACTS OF THE TWENTY-SIXTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF PARASITOLOGISTS, CHICAGO, ILLINOIS

November 15, 16, 17, 1951

PROGRAM[1]

THURSDAY MORNING SESSION, NOVEMBER 15, 9:00 AM, CONGRESS HOTEL, CASINO ROOM.

Read

1. Studies on the Host-Specificity of the Enteric Protozoa of Rodents. (12 min) (Lantern) C. D. MILLER AND L. H. SAXE, The State University of Iowa.

2. Agar, Magnesium and Phosphate in Relation to Growth of *E. histolytica* in Extract Medium. (10 min) (Lantern) E. CLIFFORD NELSON, Medical College of Virginia.

3. Some Effects of Carbon Dioxide in the Environment for the Cultivation of Parasitic Protozoa. (10 min) (Lantern) ERNEST HARTMAN, Stritch School of Medicine, Loyola University.

4. Hyaluronidase Production by *Endamoeba histolytica.* (12 min) (Lantern) JOHN L. BRADIN, JR., The Tulane University of Louisiana.

5. Comparative Effects of Drying on the Cysts of *Endamoeba coli* and *E. histolytica.* (12 min) (Lantern) LUCY V. REARDON, ELIZABETH VERDER AND CHARLES W. REES, National Microbiological Institute, Bethesda.

6. Respiration of the Spleen during Infection with *Plasmodium gallinaceum* and Development of Immunity. (12 min) (Lantern) W. H. TALIAFERRO AND J. W. MOULDER, University of Chicago.

7. Studies on Chicken Isohemagglutinins and their Relation to Passive Immunity in *P. lophurae* Malaria. (12 min) (Lantern) THOMAS M. SCHWINK AND ELERY R. BECKER, Iowa State College.

8. The Course of the Blood-Induced *Plasmodium berghei* Infection in White Rats. (12 min) (Lantern) TERESA I. MERCADO AND G. ROBERT COATNEY, National Microbiological Institute, Bethesda.

9. The Course of Blood-Induced *P. lophurae* Malaria in Young Goslings and Guinea Fowl Chicks. (10 min) (Lantern) ELERY R. BECKER, Iowa State College.

10. Notes on *Haemoproteus metchinikovi* in Turtles from Wisconsin, Michigan, and Louisiana. (10 min) (Lantern) DOMINIC L. DE GIUSTI AND PETER J. BATTEN, JR., Wayne University and the University of Michigan Biological Station.

11. The Effect of the Protozoan Parasite *Eimeria stiedae* on the Cytochrome Oxidase Activity of the Liver of Rabbits. (10 min) (Lantern) BARNETT F. SMITH, Spelman College.

[1] An alphabetical author index will be found at the end of the program. Extra copies of this supplement, and portraits of parasitologists, will be on sale at the meeting.

12. Action of S-Containing Aminoacids on Some Trypanosomes and Leishmanias. (7 min) (2″ × 2″ slides) VIOLA MAE YOUNG AND PHYLLIS CONNER, Hektoen Institute of Cook County Hospital, Chicago.

13. Protein Analyses of Sera from Rats with *Trypanosoma lewisi* Infection and Sodium Salicylate Treatment. (12 min) (Lantern) M. G. LYSENKO, University of Wisconsin.

14. Efficacy of 0.0055 Per Cent Nitrofurazone Fed Continuously for the Control of Avian Coccidiosis under Conditions of Natural Infection. (12 min) (Lantern) PAUL D. HARWOOD AND DOROTHY I. STUNZ, Dr. Hess and Clark Research Laboratory, Ashland, Ohio.

15. Chemotherapy Studies on Histomoniasis. (12 min) (Lantern) W. C. MCGUIRE AND NEAL F. MOREHOUSE, Dr. Salsbury's Laboratories, Charles City, Iowa.

16. Studies on Larval Marine Bucephalids. (12 min) (Lantern) (Also by Demonstration) SEWELL H. HOPKINS, Agricultural and Mechanical College of Texas.

By Title

17. The Action of Antibiotics on *Aspiculuris tetraptera* in Mice. H. S. WELLS, Columbia University School of Public Health (Introduced by H. W. BROWN).

18. Life Cycle Studies of *Syphacia obvelata* and their Relationship to Chemotherapy. KAM-FAI CHAN, Columbia University School of Public Health.

19. The Effect of Small Amounts of Phenothiazine on the Development of the Ova of the Gastrointestinal Nematode Parasites of Cattle. G. E. CAUTHEN, Texas Agricultural Experiment Station.

20. Some New *Thelandros* (Nematoda; Oxyuridae) from the Island Night Lizard, *Xantusia riversiana reticulata* Smith, from San Clemente Island, California. JOHN T. LUCKER, U. S. Bureau of Animal Industry.

21. The Reproduction of *Rhabditis briggsae* (Nematoda) as Influenced by Steroid Hormones and Thyroxine. ALEX L. ROSEN, ELLSWORTH C. DOUGHERTY AND HOWARD A. BERN, University of California, Berkeley.

22. Rate of Development and Viability of *Ascaridia galli* Eggs Cultured Respectively in Air and in Water. M. F. HANSEN, R. OONYAWONGSE AND J. E. ACKERT, Kansas State College, Manhattan.

23. The Modes of Egg-Laying in the Nematode Family Thelastomatidae. M. A. BASIR, Macdonald College, Quebec, and The Muslim University, Aligarh, U. P., India.

24. Dispersing Agents Suitable for Dispersing Several Insoluble Molluscacides. R. E. FREYTAG, G. W. HUNTER III AND L. S. RITCHIE, 406th Medical General Laboratory, Tokyo, Japan.

25. Potential Molluscacides Screened in the Laboratory and their Results in Preliminary Field Plot Tests. G. W. HUNTER III, L. S. RITCHIE AND R. E. FREYTAG, 406th Medical General Laboratory, Tokyo, Japan.

26. Observations on the Laying and Incubation of Eggs of *Oncomelania nosophora*. L. S. RITCHIE, G. W. HUNTER III AND Y. OTORI, 406th Medical General Laboratory, Tokyo, Japan.

27. Parasitological Studies in the Far East. VIII. An Epidemiologic Survey of the Tone River Area, Japan. L. S. RITCHIE, G. W. HUNTER III, C. PAN, 406th

Medical General Laboratory, M. YOKOGAWA, National Institute of Health, AND K. NAGANO, Kitasato Institute, Tokyo, Japan.

28. Parasitological Studies in the Far East. IX. An Epidemiologic Survey on Shikoku Island, Japan. G. W. HUNTER III, L. S. RITCHIE, C. PAN, 406th Medical General Laboratory, M. YOKOGAWA, National Institute of Health, Tokyo, Japan.

29. Parasitological Studies in the Far East. XII. An Epidemiologic Survey of Shizuoka Prefecture, Japan. L. S. RITCHIE, G. W. HUNTER III, R. E. FREYTAG, C. PAN, 406th Medical General Laboratory, Tokyo, Japan, AND M. YOKOGAWA, National Institute of Health and Institute of Public Health and Welfare, Tokyo, Japan.

THURSDAY AFTERNOON SESSION, NOVEMBER 15, 2:00 PM, CONGRESS HOTEL, CASINO ROOM.

Read

30. The Survival of *Toxoplasma gondii* in Various Fluids. (12 min) (Lantern) LEON JACOBS, National Institutes of Health and Pan American Sanitary Bureau, FRANCES E. JONES AND MARJORIE L. MELTON, National Institutes of Health, Bethesda.

31. Axenic *Neoplectana glaseri* in Fluid Cultures. Second Report. (12 min) (Lantern) NORMAN R. STOLL, Rockefeller Institute for Medical Research, New York.

32. Retarded Growth of *Litomosoides carinii* after the Introduction of Non-Living Antigenic Material into the Host. (10 min) (Lantern) J. ALLEN SCOTT AND ETTA MAE MACDONALD, The University of Texas School of Medicine, Galveston, Texas.

33. The Relation of the Secretions and Excretions of the Larvae of *Nippostrongylus muris* to the Production of Protective Antibodies. (12 min) (Lantern) R. E. THORSON, The Johns Hopkins University.

34. Regulation of Water Balance as a Function of the Excretory System of the Filariform Larvae of *Nippostrongylus muris* and *Ancylostoma caninum*. (12 min) (Lantern) PAUL P. WEINSTEIN, National Microbiological Institute, Bethesda.

35. Chemical Observations on the Metabolism of the Larvae of *Trichinella spiralis*. (12 min) (Lantern) THEODOR VON BRAND, PAUL P. WEINSTEIN AND BENJAMIN MEHLMAN, National Microbiological Institute, Bethesda.

36. Natural Infections of *Trichinella spiralis* in Skunks. (12 min) LLOYD A. SPINDLER AND DONALD O. PERMENTER, U. S. Bureau of Animal Industry.

37. The Effect of Helminths on the Basement Membrane and Ground Substance of the Host: A Study of the Mechanism of Penetration. (10 min) (2″ × 2″ slides) R. M. LEWERT AND CHANG LING LEE, University of Chicago.

38. Further Studies on the Pathogenicity of *Nematodirus spathiger* and Development of Resistance to Reinfection. (10 min) (Lantern and 2″ × 2″ slides) K. C. KATES AND J. H. TURNER, U. S. Bureau of Animal Industry.

39. Preliminary Cytochemical Studies on Vitamin C in the Larvae of *Trichinella spiralis*. (10 min) (Lantern) W. L. BULLOCK, University of New Hampshire.

40. Effects of Fowl Ascarid Parasitism upon Host Resistance to a Bacterial Toxin. (12 min) (Lantern) J. E. ACKERT, J. R. EGERTON AND M. F. HANSEN, Kansas State College, Manhattan.

41. On the Migratory Behavior of the Larvae of Various *Ascaris* Species in Mice. (12 min) (Lantern and 2″ × 2″ slides) J. F. A. SPRENT, Ontario Research Foundation.

42. Observations on Larval Carnivore Ascarids in Rodents. (12 min) JACK D. TINER, University of Illinois.

43. Effects of Detergents on Embryogeny of *Ascaris lumbricoides* var. *suum.* (10 min) (Lantern) B. J. JASKOSKI, The Creighton University.

44. A Survey of the Internal Parasites of the School Children of Bimini, The Bahamas, B.W.I. (10 min) (Lantern) LYELL J. THOMAS, The University of Illinois and The American Museum of Natural History.

By Title

45. The Trematode Family Microphallidae with the Report of a New Genus. R. M. CABLE AND M. L. KUNS, Purdue University.

46. Parasites of the Amphibia. Trematoda. I, II, III. A. C. WALTON, Knox College, Galesburg, Illinois.

47. *Brachylaima condylura,* n. sp., from the Star-Nosed Mole, *Condylura cristata.* THERON O. ODLAUG, University of Minnesota, Duluth Branch.

48. Some Factors Involved in the Hatching of *Hymenolepis diminuta* onchospheres. W. MALCOLM REID, LOREN ALLAMAN AND FRANK FITCH, Monmouth College, Monmouth, Illinois.

49. *Diphyllobothrium latum* in the Dog. M. S. FERGUSON, Communicable Disease Center, Atlanta.

50. *Diphyllobothrium latum* Indigenous in the Lake District of Chile. (Also by Demonstration) (ERNEST CARROLL FAUST, Tulane University, AMADOR NEGHME R. AND ISAÍAS TAGLE V., Universidad de Chile.

THURSDAY EVENING, NOVEMBER 15, 7:00 PM, CONGRESS HOTEL, PARLOR E. Dinner and Council meeting, officers and members of the Council.

FRIDAY MORNING SESSION, NOVEMBER 16, 9:00 AM, CONGRESS HOTEL, CASINO ROOM.

Symposium

The Ecology of Vectors of Parasitic Diseases

ELOISE B. CRAM, Vice President, Chairman

51. *Phlebotomus* spp. as Related to Leishmaniasis. (20 min) (Lantern) MARSHALL HERTIG, Gorgas Memorial Laboratory, Panama.

52. Vectors of Onchocerciasis in Guatemala. (20 min) (Lantern) HERBERT T. DALMAT, Laboratory of Tropical Diseases, National Institutes of Health, and Pan American Sanitary Bureau.

53. Vectors of *Diphyllobothrium* spp. (20 min) (Lantern) LYELL J. THOMAS, University of Illinois.

54. Snail Vectors of *Schistosoma japonicum* in the Philippine Islands and Japan. (20 min) (Lantern) DONALD B. MCMULLEN, School of Medicine, University of Oklahoma.

55. *Pomatiopsis lapidaria,* Its Occurrence in the Washington, D. C., Area and Its Laboratory Rearing in Comparison with that of *Oncomelania* spp. (20 min)

(Lantern) WILLIAM B. DEWITT, Laboratory of Tropical Diseases, National Institutes of Health.

Presidential Address

56. Livestock Parasitology in the United States. (60 min) BENJAMIN SCHWARTZ, Zoological Division, U. S. Bureau of Animal Industry.

FRIDAY AFTERNOON SESSION, NOVEMBER 16, 2:00 PM, ROOSEVELT COLLEGE

By Demonstration

57. Comparative Morphology of Some Rat Flea Larvae (Siphonaptera). ROBERT E. ELBEL, Communicable Disease Center, Atlanta.

58. A Species of *Alaria* from the Marten (*Martes a. americana*). J. C. PEARSON (Introduced by A. M. FALLIS, Ontario Research Foundation, Toronto).

59. A Species of *Dirofilaria* from the Black Bear (*Euarctos a. americanus*). R. C. ANDERSON (Introduced by J. F. A. SPRENT, Ontario Research Foundation, Toronto).

60. Exo-erythrocytic Stages of *Plasmodium falciparum*. G. M. JEFFERY, National Institutes of Health, Milledgeville, Georgia; G. B. WOLCOTT, AND M. D. YOUNG, National Institutes of Health, Columbia, South Carolina; AND D. C. WILLIAMS, JR., National Institutes of Health, Milledgeville, Georgia.

61. Studies in the Use of Mucoids by *Clinostomum marginatum*. FRANCIS J. KRUIDENIER, The University of Illinois.

62. The Procercoid Larva of *Lacistorhynchus tenuis* (van Ben. 1858). NATHAN W. RISER, Fisk University.

63. The Toxicity of Tetravalent Tin Compounds for Chickens. K. B. KERR AND A. W. WALDE, Dr. Salsbury's Laboratories, Charles City, Iowa.

64. Exhibits: Human Case of Sarcocystosis from the Congoes. OSCAR FELSENFELD, Hektoen Institute of Cook County Hospital, Chicago.

65. Hermaphroditic Female *Schistosomatium douthitti*. ROBERT B. SHORT, Florida State University.

66. The Cultivation of *Trypanosoma cruzi* in Egg Yolk Infusion Medium. MAX C. MCCOWEN, C. ROSALIND MAYNARD AND MAURICE E. CALLENDER, Lilly Research Laboratories, Indianapolis.

67. Causative Agents of Swimmer's Itch in Narragansett Bay, Rhode Island. HORACE W. STUNKARD, New York University.

50. *Diphyllobothrium latum* Indigenous in the Lake District of Chile. (Also Read by Title) ERNEST CARROLL FAUST, Tulane University, AMADOR NEGHME R. AND ISAÍAS TAGLE V., Universidad de Chile.

16. Studies on Larval Marine Bucephalids. (Also Read) SEWELL H. HOPKINS, Agricultural and Mechanical College of Texas.

68. Some Observations on the Blood of the Hamster Infected with Leishmaniasis. L. A. STAUBER AND D. G. GEMEROY, Rutgers University.

SATURDAY MORNING SESSION, NOVEMBER 17, 9:00 AM, CONGRESS HOTEL, CASINO ROOM.

Read

69. Ecology of Worm Parasites in Salamanders from South-Central New York. (10 min) (Lantern) JACOB H. FISCHTHAL, Harpur College, State University of New York, Endicott.

70. The Effect of Some Pyridine and Piperidine Compounds on Horse Strongyle Larvae in Manure. (12 min) (Lantern) NORMAN D. LEVINE, University of Illinois.

71. Tetravalent Tin Compounds as Anthelmintics. (12 min) (Lantern) K. B. KERR AND A. W. WALDE, Dr. Salsbury's Laboratories, Charles City, Iowa.

72. Chemotherapeutic Studies of Natural Pinworm Infestations in Mice with Reference to Screening for New Antioxyurid Agents. (10 min) (Lantern) J. W. REINERTSON AND PAUL E. THOMPSON, Parke, Davis and Company.

73. Results of Feeding Small Amounts of Phenothiazine during the Prepatent Period of the Nodular Worm of the Calf. (12 min) (Lantern) ROY L. MAYHEW, Louisiana State University.

74. Skin-Tests for Paragonimiasis with Antigen from Adult Worms of *Paragonimus westermani.* (10 min) L. S. RITCHIE, G. W. HUNTER III AND C. PAN, 406th Medical General Laboratory, Tokyo, Japan, AND M. YOKOGAWA, National Institute of Health and Institute of Public Health and Welfare, Tokyo, Japan.

75. Acquired Immunity in Mice Infected with *Schistosomatium douthitti* (Cort) (Trematoda: Schistosomatidae). (10 min) (Lantern) IRVING G. KAGAN, The University of Chicago.

76. The Influence of Previous Infection of Mice with *Schistosoma mansoni* on a Challenging Infection with the Homologous Parasite. (12 min) (Lantern) M. A. STIREWALT, Naval Medical Research Institute, Bethesda.

77. Distribution and Periodical Activity of Chiggers Near Duke University. (12 min) (Lantern) G. W. WHARTON, Duke University.

78. The Free Amino Acids in the Whole Bodies of Culicid Mosquitoes. (12 min) (Lantern) EDGAR W. CLARK AND GORDON H. BALL, University of California at Los Angeles.

79. The Relationship of *Culicoides* (Diptera, Ceratopogonidae) to the Transmission of *Onchocerca volvulus.* (10 min) (Lantern) COLVIN L. GIBSON, National Institutes of Health and Pan American Sanitary Bureau, AND WERNER F. ASCOLI, Pan American Sanitary Bureau.

By Title

80. *Entamoeba terrapinae* Infections in Snakes. M. J. MILLER, Macdonald College, Quebec (Introduced by T. W. M. CAMERON).

81. The Transmission of Non-Cyst-Forming Intestinal Flagellates in the Yucca Night Lizard *Xantusia vigilis.* Y. U. AMREIN, University of California at Los Angeles.

82. Chagas' Disease in the United States. EMMANUEL DIAS, Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.

83. Action of Cortisone Alone or Associated to Pentaquine Phosphate or to the Compound Pentaquine Phosphate-Quinine Sulphate on Experimental Trypanosomosis (*T. cruzi*) in Mice. MOISES AGOSÍN, RENÉ CHRISTEN AND ARTURO JARPA, University of Chile, Santiago, Chile (Introduced by AMADOR NEGHME).

SATURDAY NOON, NOVEMBER 17, 12 NOON, CONGRESS HOTEL, CASINO ROOM

Annual Luncheon and Business Meeting.

SATURDAY AFTERNOON, NOVEMBER 17, 2:00 PM, CONGRESS HOTEL, CASINO ROOM.

Joint Session, American Society of Tropical Medicine, National Malaria Society and American Society of Parasitologists.

To be Read by Members of A.S.P.

84. "Operation Santobrite"—A Schistosome Snail Eradication Program in Japan. (12 min) (Lantern and 2″ × 2″ slides) G. W. HUNTER III, L. S. RITCHIE, R. E. FREYTAG, C. PAN, D. E. POTTS, 406th Medical General Laboratory, Tokyo, Japan, AND M. YOKOGAWA, National Institute of Health and Institute of Public Health and Welfare, Tokyo, Japan.

85. Some Effects of Cultural Associates on the Infectivity of a Strain of *Endamoeba histolytica.* (12 min) (Lantern) GEORGE W. LUTTERMOSER AND BRUCE P. PHILLIPS, National Microbiological Institute, Bethesda.

86. Comparative Susceptibility of Common Laboratory Animals to Experimental Infection with *Schistosoma haematobium.* (10 min) (2″ × 2″ slides) DONALD V. MOORE AND HENRY E. MELENEY, New York University, College of Medicine.

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ABSTRACTS

1. *Studies on the Host-Specificity of the Enteric Protozoa of Rodents.* C. D. Miller and Saxe, Department of Zoology, The State University of Iowa.

Protozoan-free *Rattus norvegicus* and *Mesocricetus auratus,* and naturally faunated *Citellus tridecimlineatus tridecimlineatus* were used as recipients in transfaunation experiments. The cecal faunas of *Citellus* recipients were examined by laparotomy before attempting cross-infections. Infections by the oral route (M) or by laparotomy (L) were attempted as indicated. Other symbols: numerator = number of successful transfaunations, denominator = number of recipients, NF = not found.

Citellus to *Rattus* (M): *Octomitus pulcher* (0/18), *Hexamitus teres* (0/18), *Monocercomonoides pilleata* (0/9), *Chilomastix magna* (0/9), *Hexamastix muris* (0/18), *Entamoeba citelli* (0/18). *Citellus* to *Mesocricetus* (M or L): *O. pulcher* (0/10), *H. teres* (0/10), *M. pilleata* (0/7), *C. magna* (0/2), *H. muris* (0/6), *E. citelli* (0/10). *Mesocricetus* to *Citellus* (M or L): *Trichomonas muris* (6/8), *Trichomonas minuta* (0/8), *Trichomonas wenyoni* (NF/4). Two *Citellus* from the immediately preceding experiment, after 13 days, served as donors in a *Citellus* to *Mesocricetus* experiment (M): *O. pulcher* (0/5), *H. teres* (0/5), *M. pilleata* (0/5), *C. magna* (0/5), *T. muris* (5/5), *T. wenyoni* (5/5), *Trichomonas microti* (a new record for *Citellus*) (5/5), *E. citelli* (0/5). No natural infections of *T. muris* were found in any of 28 *Citellus* examined.

Tamias striatus griseus to *Rattus* (M) and *Mesocricetus* (M): *O. pulcher* (0/27), *T. microti* (a new host record) (26/27), *E. muris* (0/27).

Peromyscus maniculatus bairdi to *Mesocricetus* (M): *Giardia* sp. (0/2), *O. pulcher* (1/2), *Chilomastix* sp. (2/2), *H. muris* (2/2), *Trichomonas* sp. (*T. muris*-like) (0/2), *E. muris* (0/2). *Peromyscus* to *Citellus* (M): above organisms (0/3).

2. *Agar, Magnesium and Phosphate in Relation to Growth of* E. histolytica *in Extract Medium.* E. Clifford Nelson, Medical College of Virginia, Richmond, Virginia.

In the course of investigation of the growth of *E. histolytica* in extract medium the agar constituent was found to play an important role. Without the addition of agar, phosphate buffered saline solutions of egg yolk or liver extracts will not support *E. histolytica* growth. The addition of at least 0.4 percent agar enables growth. In fact, continuous, though low level, growth can be maintained on a medium composed of an agar slant, phosphate buffer saline overlay and Difco rice powder. The addition of extract to the agar base improves growth. When suspended in the overlay, egg yolk extract is inhibitory in concentration greater than two percent but liver extracts are not inhibitory at much higher concentration.

The phosphate buffer was found to be essential. Growth decreased when the phosphate buffer was reduced below M/40 and failed at M/80 dilution. M/10 or greater concentration proved inhibitory.

A highly purified agar was found to be incapable of supporting growth. Magnesium addition in the form of sulphate, chloride or acetate restored the ability of the purified agar to support growth. The ability of purified agar to support growth can be restored also by the addition of extract. The magnesium salts or extract will not support growth in the absence of purified agar. The role of purified agar is under investigation.

3. *Some Effects of Carbon Dioxide in the Environment for the Cultivation of Parasitic Protozoa.* Ernest Hartman, Stritch School of Medicine, Loyola University, Chicago.

Endamoeba histolytica, Trypanosoma cruzi and *Trichomonas vaginalis* have been found to grow in suitable media that is not over one centimeter in depth when the CO_2 in the atmosphere is increased. The first two species will grow satisfactorily with the CO_2 up to 50%. *Trichomonas vaginalis* grows best at 10–25% CO_2. Under the same conditions except that additional CO_2 is absent, growth is much less or the culture dies out on serial transfer.

While it is generally realized that the CO_2 concentration is higher in the host tissues than in air, it seems that CO_2 has not previously been considered as a favorable factor in the environment of animal parasites.

A simple technique for providing known amounts of CO_2 has been devised which consists in a tablet of a carbonate and organic acids to be dropped into water in any suitable container such as a fruit jar.

4. *Hyaluronidase Production by* Endamoeba histolytica. John L. Bradin, Jr., The Tulane University of Louisiana.

The importance of hyaluronic acid for the integrity of connective tissue and the role of hyaluronidase in infectious disease processes suggests consideration of this enzyme as a possible mechanism in the pathogenesis of amebiasis.

By the use of special *in vitro* technics in which growth of associated bacteria was markedly inhibited, seven strains of amebae, maintained routinely in cultures, were assayed for hyaluronidase activity, using a turbidimetric method. No enzyme activity was demonstrated.

Review of bacteriological literature reveals that hyaluronidase activity along with virulence disappears upon continuous serial passage of hyaluronidase-producing bacteria in culture. Inasmuch as the virulence of *E. histolytica* has been shown to diminish in cultures and to be restored again upon animal passage (Chang, 1945), it was felt that amebae freshly isolated from infected animals would be more suitable for studies on mechanisms of pathogenesis. Hamsters were infected intrahepatically (Thompson, personal communication) with *E. histolytica* of human origin (our strain no. 22). Animals were sacrificed five days after inoculation, the amebae recovered from the hepatic abscesses, separated from necrotic material by repeated washing and assayed for hyaluronidase activity. Enzyme was found to be produced. Production continued upon serial passage in cultures in aqueous egg-yolk infusion (Balamuth, 1946), with disappearance of enzyme activity in the second or third serial subculture.

It is therefore suggested that hyaluronidase may play a role in pathogenesis. These studies emphasize the fact that *in vitro* results are not necessarily a reflection of *in vivo* behavior.

5. *Comparative Effects of Drying on the Cysts of* Endamoeba coli *and* E. histolytica. Lucy V. Reardon, Elizabeth Verder, and Charles W. Rees, National Microbiological Institute, Bethesda, Maryland.

The viability of cysts of *Endamoeba coli* that were microisolated from the flora of stools and cultures, transferred to 0.85 percent NACl, and dried in air at 80° F and approximately 25 percent relative humidity, was not demonstrably affected by the drying treatment. The percentages of amoeba-cultures obtained from 10 to 20 dried cysts per tube of whole egg medium that was seeded with organism *t* and *Bacillis subtilis* were not lower than from the non-dried control cysts. On the other hand, the cysts of *E. histolytica,* microisolated and dried under the above conditions, failed to produce cultures of amoebae although high percentages of cultures were obtained from the non-dried controls. Other cultural differences between the two species of *Endamoeba* comprised the failure of *E. coli* to grow in the presence of organism *t* alone, the streptobacillus of Shaffer and Frye, or *Trypanosoma cruzi* with each of which associated microorganism the growth of *E. histolytica* has been demonstrated. When observed microscopically during drying the cysts of both species of *Endamoeba* became indented, the indentation increasing until the cysts appeared as crescents. They finally became indistinguishable among the salt crystals. On restoration of the saline solution the cysts of both species regained their spherical shape, although the cysts of *E. histolytica* showed some retraction of the protoplasm from the cyst wall. On addition of the iodine stain the nuclei of the cysts of *E. coli* were clear whereas those of *E. histolytica* were cloudy. The microscopic observations are in agreement with the cultural data, indicating that the viability of the cysts of *E. coli* was not affected by drying under the conditions outlined while *E. histolytica* cysts were inactivated.

6. *Respiration of the Spleen during Infection with* Plasmodium gallinaceum *and Development of Immunity.* W. H. Taliaferro and J. W. Moulder, University of Chicago.

Immune reactions during infection with *Plasmodium gallinaceum* in the chicken take place chiefly in the spleen and to less extent in the liver and bone marrow. In the spleen they are associated with phagocytosis, mitotic proliferation of various cells—especially lymphoid cells, the development of plasma cells, and the homoplastic and heteroplastic development of macrophages. The progressive and regressive histological changes associated with the rise and fall of the infection and the development of splenomegaly were not associated with any detectable change in the nature or rate of carbohydrate metabolism per unit weight of spleen slices. Throughout the course of the infection, including intense immune reactions, there was no significant change in oxygen uptake, respiratory quotient, anaerobic glycolysis, or glucose utilization. These results do not preclude an increased metabolic rate per cell of the lymphoid macrophage system during the intense immune reactions because at these times the splenic tissue often contains fewer cells per unit volume.

7. *Studies on Chicken Isohemagglutinins and their Relation to Passive Immunity in* P. lophurae *Malaria.* Thomas M. Schwink and Elery R. Becker, Iowa State College.

Actively acquired isohemagglutinins for the erythrocytes of the donor chickens were produced in chickens by two or three heavy intramuscular injections of washed erythrocytes. The isohemagglutination was accelerated by supplementing the immune plasmas with nonimmune chicken plasmas, either previously frozen or not, that of themselves were nonagglutinating. The hemagglutinating property of the immune plasmas was considerably enhanced by freezing and thawing previous to their use. Supplements of nonimmune chicken plasmas, whether previously frozen or not, to these previously frozen immune plasmas inhibited, rather than accelerated,

hemagglutination of the donor erythrocytes. The influence of duck plasma on the hemagglutination was comparable to that of the heterologous chicken plasmas. Experiments designed to determine the relation of the isohemagglutinins to passively acquired immunity to *P. lophurae* malaria in chickens are in progress.

8. *The Course of the Blood-Induced* Plasmodium berghei *Infection in White Rats.* Teresa I. Mercado and G. Robert Coatney, National Microbiological Institute, Bethesda, Maryland.

Plasmodium berghei in the white rat gave rise to two types of infection, lethal and latent. The lethal infection was characterized by a prepatent period of 2 to 5 days, a patent period of 8 to 21 days, and a parasitemia which reached a peak in 4 to 20 days. Death of most animals occurred 24 hours after the peak. In the latent infection the first parasites appeared in the blood 2 to 5 days after inoculation. The parasitemia increased progressively during the first eight days of patency and then gradually declined until latency occurred. The peak was reached in 7 to 16 days. The patent period ranged from 16 to 22 days.

Daily counts of the number of merozoites per segmenter showed that in both types of infection the merozoite mean was low at the beginning of patency, reached a maximum in 5 to 8 days, gradually declined until the sixteenth day when the average closely approximated the early counts, and then progressed to a second lower peak at the terminal stage.

The effect on the erythrocyte count was marked. In the lethal infection the count dropped from an initial normal value of 5.32 millions per cu. mm. to 1.06 on the tenth day. Thereafter little change occurred until death. A decrease to 0.78 million red blood cells per cu. mm. from a normal count of 4.91 occurred in the latent infections on the twelfth day. In contrast to the lethal infection these animals recovered from the anemia as the parasitemia subsided and showed an increase in the erythrocyte count to 3.28 on the eighteenth day.

9. *The Course of Blood-induced* P. Lophurae *Malaria in Young Goslings and Guinea Fowl Chicks.* Elery R. Becker, Iowa State College.

The infections were induced by the intravenous injection of 2×10^8 parasitized cells per 100 g. of body weight. The eight goslings employed were ten days old when injected and the two guinea fowl chicks 21 days old. All the goslings experienced infections more fulminating if anything than those usually seen in ducklings of the same age, and all resulted fatally within 8 days. The course of the infections in the guinea fowl chicks was more like that usually encountered in chicks of the common fowl, taking into consideration the variability of the latter.

10. *Notes on* Haemoproteus metchinikovi *in Turtles from Wisconsin, Michigan, and Louisiana.* Dominic L. De Giusti, and Peter J. Batten, Jr., Wayne University and the University of Michigan Biological Station.

Plimmer 1912 reported finding *Haemoproteus* in a *Chrysemys picta* from North America which died in the London zoo. Hewitt 1940 reported *Haemoproteus metchinikovi* from *Pseudemys elegans* purchased in a Baltimore fish market. In neither of these reports were locality data available.

In a survey conducted by the present authors a parasite resembling that described by Simond 1901 as *Haemoproteus metchinikovi* has been found in *Chrysemys picta marginata* collected from various localities in Wisconsin and Michigan and in *Pseudemys elegans* collected from Louisiana. The parasite was found also in *Graptemys geographica* from Wisconsin. To our knowledge, *Graptemys geographica* constitutes a new host record for this parasite.

11. *The Effect of the Protozoan Parasite,* Eimeria stiedae, *on the Cytochrome Oxidase Activity of the Liver of Rabbits.* Barnett F. Smith, Spelman College.

Rabbits ranging in ages from two to five months were infected with approximately 2 million sporulated oocysts of *Eimeria stiedae.* The infections were allowed to continue for 10, 15, and 20 days. Normal animals and infected animals were sacrificed in order to obtain liver tissue for purpose of enzymatic assay.

Pieces of liver ranging in weight from 50 to 100 mg. were homogenized in 0.5 ml. of cold, glass-distilled water. Sufficient glass-distilled water was later added to make a 1 per cent homogenate. Two-tenths and 0.4 ml. of the homogenate were used, and the cytochrome oxidase activity was determined. The cytochrome oxidase activity was expressed in terms of Qo_2, mm^3 of O_2 consumed per mg. of dry tissue per hour.

By means of the Warburg respirometer the Qo_2 was determined for normal rabbit liver and for liver of rabbits infected for 10, 15, and 20 days. The Qo_2 for normal liver was 75.7 as compared to 81.4 for liver 10 days after infection. The Qo_2 for liver tissue 15 days after infection was 56.1 as compared to 56.3 for liver of rabbits 20 days after infection. The data are discussed and two possible explanations are given for the decrease in cytochrome oxidase activity.

12. *Action of S-Containing Aminoacids on Some Trypanosomes and Leishmanias.* Viola Mae Young and Phyllis Conner, Hektoen Institute of Cook County Hospital, Chicago, Illinois.

Cultures of *T. cruzi, T. connorhini, L. donovani* and *L. tropica* were grown in the presence of isomers of 5 S-containing aminoacids and their combinations. The effect of these compounds on the growth curves and morphology of the cultured organisms is shown by lantern slides.

13. *Protein Analyses of Sera from Rats with* Trypanosoma lewisi *infection and Sodium Salicylate Treatment.* M. G. Lysenko, University of Wisconsin.

Protein analyses were made to try to learn the nature of the sodium salicylate inhibition of ablastic activity in rats with *T. lewisi* as found by Becker and Galligher (1947).

Total protein levels were determined on four groups of rats. These were (1) rats with *T. lewisi* and salicylate treatment, (2) *T. lewisi* only, (3) salicylate only, and (4) normal controls. Sera were collected on the 10th day of the infection when ablastin was high and trypanocidal antibody low in titer. Standard Micro-Kjeldahl procedure was used. The results showed that the total proteins in the *T. lewisi* only group were above the normals; while those in the *T. lewisi* plus salicylate group were below the normal.

Electrophoretic studies were made on sera of similar groups of animals. At this time two series of runs on pooled samples have also shown higher and lower total protein levels in groups 2 and 1 respectively. A significant finding was that the gamma globulin levels in the *T. lewisi* only group was two to three times higher than in the *T. lewisi* and salicylate group.

This evidence would indicate that salicylate treatment prevents the synthesis of the anti-reproductive substance and hence allows reproduction of the trypanosomes to continue in the treated and infected hosts.

14. *Efficacy of 0.0055 per cent Nitrofurazone Fed Continuously for the Control of Avian Coccidiosis under Conditions of Natural Infection.* Paul D. Harwood and Dorothy I. Stunz, Dr. Hess and Clark Research Laboratory, Ashland, Ohio.

Harwood and Stunz (1950) demonstrated that 0.0067 per cent nitrofurazone effectively reduced losses in naturally occurring outbreaks of avian coccidiosis. Following their suggestion a reduced level of the drug (0.0055 per cent) was employed in 5 experiments involving more than 5,000 chickens. In each case the birds receiving 0.0055 per cent nitrofurazone suffered fewer deaths from coccidiosis and made superior weight gains. In a typical test 200 birds were placed in each of 3 similar pens of 150 square feet. The control birds averaged 116.7 grams at 3 weeks of age, 330.7 at 6 weeks, 713.9 at 9 weeks and 1160.4 at 12 weeks. Similar mean weights for the principals receiving 0.0055 per cent nitrofurazone continuously in the mash were 122.5, 352.1, 732.8, and 1248.1 grams; for a reference control pen receiving 0.0125 per cent sulfaquinoxaline 141.7 , 370.3, 732.8 and 1248.1 grams. Deaths from coccidiosis totalled 10, 3 and 6 in the three pens respectively. In these tests each bird was handled every three weeks. Evidence of natural infection with coccidiosis was first noted about three weeks of age. Usually the first deaths occurred during the 5th week, reached a peak during the 6th or 7th week; the latest deaths occurring during the 8th or 9th week. Therefore, treatment limited to one or even two weeks of the epizootic merely reduces the losses at the peak, but does nothing to combat such losses during the greater portion of the epizootic. Consequently, continuous medication until resistance to coccidiosis is acquired seems desirable.

15. *Chemotherapy Studies on Histomoniasis.* W. C. McGuire and Neal F. Morehouse, Dr. Salsbury's Laboratories, Charles City, Iowa.

Studies have been made on the chemoprophylactic effect of 4-nitro benzéne arsonic acid when administered in drinking water or feed of turkeys experimentally infected with *Histomonas meleagridis,* the causative agent of blackhead. The importance of a post-medication observation period when evaluating the chemotherapeutic effect of drugs for the prevention of histomoniasis in turkeys is emphasized by results obtained in this investigation.

16. *Studies on Larval Marine Bucephalids.* Sewell H. Hopkins, Agricultural and Mechanical College of Texas.

Although many species of marine bucephalids are known from their adult forms in fishes, only two kinds of metacercaria have been described and only two cercariae have been reported in American marine waters. The author has studied the metacercariae of several species in marine fishes, and has found new bucephalid cercariae in *Ostrea equestris* and *Donax* sp. at Port Aransas, Texas. Success in this preliminary work encourages belief that additional larvae will be found, and that lack of knowledge of the larvae of marine bucephalids, up to now, was due to lack of search for them. The excretory systems of several marine bucephalids will be described. The excretory system of bucephalids differs so much from species to species that it is very useful in tying together life-cycles. The well-known bucephalid cercaria of *Crassostrea virginica* is

Bucephalus cuculus McCrady, 1874. In spite of many confident statements in the literature, nothing is known about the life-cycle of this species except that the undescribed adults occur in gars of the genus *Lepisosteus*. There is no justification for the use of the generic name *Bucephalopsis* for adult bucephalids; this use of the name is based on a hypothetical life-cycle which is not supported by any experimental evidence.

17. *The Action of Antibiotics on* Aspicularis tetraptera *in Mice.* H. S. Wells, Columbia University School of Public Health. (Introduced by Harold W. Brown).

Mice were fed 300 embryonated eggs of *Aspiculuris,* and at varying stages of the resulting infection they were treated with antibiotics orally. Treatment with terramycin and aureomycin markedly reduced the worm burden, and the worms remaining were much smaller and contained fewer eggs than those from control mice. Immature worms appear to be more susceptible to these antibiotics than do mature worms. Bacitracin is effective against young larval worms, but the mature worms are not appreciably affected by this antibiotic.

Neomycin, dihydrostreptomycin and chloroamphenicol, when given orally to infected mice, apparently improve the environment so that the treated animals retained a larger number of *Aspicularis* than did the control mice.

Polymyxin B given orally to infected mice did not diminish the worm burden, but did reduce the size of the worms harbored.

18. *Life Cycle Studies of* Syphacia obvelata *and their Relationship to Chemotherapy.* Kam-Fai Chan, Columbia University School of Public Health.

Eggs of *Syphacia obvelata* removed on scotch tape from the perianal region of animal host became infective in a matter of hours. On experimentally introducing the infection to mice, the eggs hatched at the end of the first hour in the small intestine of host and at two hours appeared in the cecum. The cecum harbored all stages of the worms of *Syphacia obvelata.* The larvae became sexually differentiated 48 hours after experimental infection. The males matured at about 96 hours and attained adult size near 120 hours. They disappeared or died after copulation. The females were fertilized as early as the fifth day, became gravid by the ninth (at end of 192 hours) and migrated out from the host between the twelfth to fifteenth day. Like *Enterobius,* the gravid females were found to be capable of staying in the rectum while discharging eggs repeatedly onto the perianal region of host.

The newly shed eggs of *Syphacia obvelata* were not infective to mice without a period of incubation. The larvae were destroyed in the stomach of mice but when the animals received large doses of larvae, a few escaped the action of gastric juice and developed the infection in the cecum of host. Several experiments failed to substantiate the possibility of retrofection in *Syphacia obvelata* infection in mice.

The close relationship between *S. obvelata* and *E. vermicularis* prompted the testing of several standard drugs on *Syphacia* infection. Bacitracin in large doses given for two consecutive days removed all of the larvae and young adults, and also caused the premature migration of female worms in mice. Gentian violet given for three days reduced the worm count by 40%, while tetrachlorethylene given in a single dose had little effect.

19. *The Effect of Small Amounts of Phenothiazine on the Development of the Ova of the Gastrointestinal Nematode Parasites of Cattle.* G. E. Cauthen, Texas Agricultural Experiment Station.

One gram of phenothiazine fed daily to calves and yearlings prevented the development of 99 percent of the ova in the feces. The stage of development did not go beyond that usually found in feces collected from the rectum.

When phenothiazine was mixed with feces, one part in 40,000 prevented the development of over 90 percent of the ova.

20. *Some New* Thelandros (*Nematoda; Oxyuridae*) *from the Island Night Lizard,* Xantusia riversiana reticulata *Smith, from San Clemente Island, California.* John T. Lucker, U. S. Bureau of Animal Industry.

Three pharyngodonin species from the gut of the Island Night Lizard are deemed to represent new species of *Thelandros.* No named indigenous North American oxyurid species has been allocated to this genus heretofore. *Thelandros pseudoechinatus* n. sp. is proposed for a species in which the three cephalic lips in the male are apically fringed; this characteristic differentiates it from all species heretofore allocated to *Thelandros;* the male otherwise most closely resembles the male of *T. echinatus,* but differs from the latter in lacking sublateral, adanal, spinous processes and spination at the distal tip of the dorsal anal lip. *Thelandros pseudothaparius* n. sp. is proposed for a species in which the esophageal morphology is of the type described for the genus *Thaparia;* this characteristic differentiates it from all species

heretofore allocated to *Thelandros;* the male otherwise most nearly resembles the male of *T. taylori,* but differs from the latter in the lesser development of its lateral and caudal alae and its longer spicule; from the males presently allocated to *Thaparia,* the male of the new species differs in that its dorsal caudal appendage is scarcely alate, spike-like and dorsally displaced and in having a relatively short spicule. *Thelandros xantusi* n. sp. is proposed for a species in which the male dorsal caudal appendage bears two adjacent pairs of sensory organs; this characteristic differentiates it from all species heretofore allocated to *Thelandros;* the male otherwise most nearly resembles the male of *T. micipsae,* but differs from the latter in having, relatively and proportionately, a much longer esophagus.

21. *The Reproduction of* Rhabditis briggsae (*Nematoda*) *as Influenced by Steroid Hormones and Thyroxine.* Alex L. Rosen, Ellsworth C. Dougherty, and Howard A. Bern, University of California (Berkeley).

Investigations to determine whether mammalian steroid hormones might affect the reproductive pattern of *R. briggsae* were made; crystalline thyroxine was also tested. The following crystalline steroids were used: methyltestosterone, testosterone, and α-estradiol; crystalline cholesterol was used for control. The basic agar medium and techniques of rearing and counting worms were those of Nigon (Ann. Sci. Nat., 11 ser., **11**: 1–132, 1949). The hormones and cholesterol were individually incorporated into cooling agar in solution (methyltestosterone) or in suspension (other steroids, thyroxine—prepared in glass bead mill by technique obtained from Professor E. C. Kendall) such that the final concentration was 40 gammas per ml.; also a drop of hormone or cholesterol preparation was added to the surfaces of the agar mounds to give a similar concentration. All substances tested except α-estradiol affected the reproductive pattern (number of worms and sex-ratios) of neither the isolated hermaphrodite nor the hermaphrodite-male pair. α-estradiol, however, strikingly decreased reproduction, without influencing sex-ratios, of worms raised thereon, but only for the first and second days of maturity; by the third day the worms appeared to have "adapted" to the presence of α-estradiol and reproduced as did cholesterol-treated controls. Progeny reverted to normal on transfer to cholesterol-agar. Statistical treatment of the results of α-estradiol-influenced vs. control reproduction during the first and second days of maturity established significant differences at the 1% level of confidence. It appears likely that this effect is unrelated to specific hormonal properties of α-estradiol. Cytological studies are planned to determine, if possible, how gametogenesis is affected.

22. *Rate of Development and Viability of* Ascaridia galli *Eggs Cultured Respectively in Air and in Water.* M. F. Hansen, R. Oonyawongse, and J. E. Ackert, Kansas State College, Manhattan.

The rates of development of 4,000 *A. galli* ova cultured in 90 per cent relative humidity and 4,000 of these ova cultured in water were studied. Both cultures were maintained at 30° C. for 30 days. The ova cultured in 90 per cent relative humidity (air cultures) developed slower and at a more irregular rate than did the ova cultured in water. Eighty per cent of the ova in the air cultures became embryonated in 30 days, while during the same period of time, 93 per cent of the ova in the water cultures became embryonated. There was a 5 per cent mortality of ova in late stages of embryogeny in the air cultures; whereas, no mortality of ova was observed in the water cultures.

In order to determine the relative viability and vigor of the infective larvae in the two types of cultures, two groups of 40, 26-day-old, Single Comb White Leghorn chickens were fed embryonated ova from each type of culture. Chickens in Group I were fed 200 ± 10 embryonated ova cultured in air and the fowls in Group II were fed the same number of ova cultured in water. Group I yielded 506 worms or an average of 12.65 worms per chicken; whereas, Group II had 389 worms or an average of 9.72 worms per fowl. The greater vigor of the worms recovered from the chickens in Group I was shown by their greater average length of 18.16 mm. as compared with the average length of 9.13 mm. of the worms recovered from the fowls in Group II,

23. *The Modes of Egg-laying in the Nematode Family Thelastomatidae.* M. A. Basir, The Institute of Parasitology, McGill University, Macdonald College, P.Q., and Muslim University, Aligarh, U.P., India.

Usually nematodes are studied as preserved specimens. Such a method does not give a correct picture either of the nature of the eggs or of the method of egg laying. The author, after studying egg-laying in living nematodes in most of the genera of Thelastomatidae, describes the form and structure of eggs in fresh condition, the nature and origin of filaments attached to them, and the method in which they are laid.

In the genera *Thelastoma, Cephalobellus, Aorurus, Blattophila, Leidynema, Leidynemella, Hammerschmidtiella, Euryconema,* and *Suifunema,* eggs are simple, oval or ellipsoidal in form; in *Blatticola* they are rhomboidal; in *Severianoia* they bear distinct grooves; in *Galebia* the shell

consists of two parts; in *Gryllophila* they have a thick shell very similar to *Ascaris* in form but not as thick, and they are laid in a chain enclosed in a tubular structure formed by the mucous secretion probably of the oviduct; in *Pseudonymous* the shell bears a knob-like protruberance on one side from which arise two filaments which are wound round the egg and unfold in water; in *Binema* and *Mirzaiella* they bear a bunch of filaments on either pole, several eggs being connected by these filaments, and are laid in mucous capsules, the number of eggs in each capsule depending on the number organically connected with each other (this varies from 1 to 7 but is generally 2 or 3); in *Chitwoodiella* eggs are laid in long chains, organically connected with each other by polar filaments but without mucous covering; in *Cameronia* eggs are fused in pairs along their flattened surfaces in a typical pattern but bear no filaments.

24. *Dispersing Agents Suitable For Dispersing Several Insoluble Molluscacides.* R. E. Freytag, G. W. Hunter III and L. S. Ritchie, 406th Medical General Laboratory, Tokyo, Japan.

Each of 23 non-ionic dispersing agents was tested on eight insoluble compounds previously shown to be potential molluscacides. A concentrate of molluscacide and dispersant (1:5) was prepared. Of this, dilutions were made which gave molluscacide concentrations of 1:250 and 1:1000. The uniformity and stability of these mixtures were determined merely by shelf-testing. Various mixtures of soluble and insoluble molluscacides were also tested. Oil emulsions were not introduced at this experimental stage, as toxicity of the oil would obscure the true efficacy of the molluscacide.

The eight insoluble molluscacides on which the dispersants were tested included: (a) copper pentachlorophenate, (b) 2,4,5-trichlorophenol, (c) 2,4,6-trichlorophenol 90% (Dowcide 2-S), (d) p-tert-butylphenol, (e) 2-chloro-6-phenylphenol, (f) 2,4-dichlorophenol, (g) p-nitrophenol, and (h) Dowcide 31. The most effective of the 23 dispersing agents and the molluscacides successfully dispersed by each (alphabetical reference) are as follows: Tergitol NPG: a, b, c, d, e, f, g; Polyethylene Glycol 600: a, b, d, g; Polyethylene Glycol 400: b, d, e, g; Trem 615: b, d, g; Sharples 2543: a; Glycox 1300: d, e; Antarox B-201: a, b, d, e; Antarox A-400: b, c, d; Emulside 65: b, g; and Antarox A-401 & A-403 (1:1): d, e.

Tergitol was the most effective, dispersing all except Dowcide 31 for which none of the agents were effective except with an oil solvent. All the other molluscacides were dispersed in water by one or more dispersants.

25. *Potential Molluscacides Screened In the Laboratory and their Results in Preliminary Field Plot Tests.* G. W. Hunter III, L. S. Ritchie and R. E. Freytag, 406th Medical General Laboratory, Tokyo, Japan.

Of 137 compounds (131 received through the cooperation of the Division of Tropical Diseases, National Institute of Health) tested in the laboratory, ten appeared promising as molluscacides for *Oncomelania nosophora*. These were Dowcide B; 2,4,5-trichlorophenol; Dowcide G; p-tert-butylphenol; Dowcide 2-S; 2-chloro-6-phenylphenol; Dowcide 31; copper pentachlorophenate; 2,4-dichlorophenol and p-nitrophenol.

Most of these compounds and several mixtures were further screened in small field plots. The following results are based on observations made 14 days after application of chemicals: Dowcide 2-S and Dowcide G were 100% lethal to snails when applied in 1:200 dilutions at a rate of 0.5 gram per square foot. Copper pentachlorophenate was 95% effective, applied in either 1:250 or 1:500 dilution at a dosage of 0.4 and 0.2 gram per square foot respectively. Two chemicals, Dowcide B and 2,4,5-trichlorophenol, each highly diluted gave low but significant results and will be retested using higher concentrations. Dowcide 31, p-nitrophenol, 2-chloro-6-phenylphenol, and 2,4-dichlorophenol were unsatisfactory. More extensive field plot tests are underway with the chemicals which gave most promising results on the preliminary tests.

26. *Observations on the Laying and Incubation of Eggs of* Oncomelania nosophora. L. S. Ritchie, G. W. Hunter III and Y. Otori, 406th Medical General Laboratory, Tokyo, Japan.

It was shown by McMullen (J. Parasit., 35 (Suppl.): 28 (Abst.) 1949) that *O. nosophora* survive well on damp filter paper in petri dishes. Mature snails have now survived for 27 months on filter paper. Such an environment, with the addition of highly decomposed leaves and straw, has served well for various experiments on this snail, including egg-laying and incubation.

In May 1951 eggs were incidentally noted in the above environment. Snail feces were the only material available in the dishes and this was being used for making egg cases, which varied in color according to food consumed shortly before laying: cases with a black sheen were commonly found on black leaves, yellowish-brown ones on straw and, not uncommonly, both occurred on filter paper. When mud squares were placed in the petri dishes, eggs were deposited in small excavations prepared by the snail, the opening being closed with a small cap. Whether the

latter was of feces or merely mud was not clearly evident. Under this condition the location of the eggs was most inconspicuous. Only small numbers of eggs have been obtained from individual snails, the maximum being about 30. In isolating the females of *O. nosophora* for laying, advantage was taken of the sex-size differential; snails 8 mm. and over tend to be females.

Incubation of *O. nosophora* and *O. quadrasi* has been reported by others as requiring about two weeks. Although hatching began on filter paper after this lapse of time, it was prolonged up to 32 days, with two peaks of maximum hatching occurring at 16–19 and 24–27 days.

27. *An Epidemiologic Survey of the Tone River Area, Japan.* L. S. RITCHIE, G. W. HUNTER III, C. PAN, 406th Medical General Laboratory, M. YOKOGAWA, National Institute of Health, AND K. NAGANO, Kitasato Institute, Tokyo, Japan.

The Tone River, located about 30 miles north of Tokyo, is one of the largest of Japan and bisects the Kanto plain of Central Honshu. The survey included communities of the Tone Valley which is one of the five known endemic centers of schistosomiasis in Japan. Intestinal parasites occurred in 90.7% of 2525 individuals; 88.0% harbored helminths and 31.8% protozoa. Specific helminths occurred as follows: *Ascaris* 64.9%, whipworm 27.3%, hookworm 48.4%, *Trichostrogylus* sp. 20.3%, pinworm (by scotch tape) 54.5%, *S. janonicum* 4.1%, *C. sinensis* 6.7% and *M. yokogawai* 0.5%. Hookworm was the dominant parasite in five of nineteen communities, the highest incidence being 84.4%. Hookworm disease, however, was observed infrequently. Schistosomiasis occurred with an incidence of 10% or higher in five villages. *Trichostrongylus* sp. occurred with an incidence of 77.7% in one village where it was the dominant parasite.

Intestinal protozoa occurred as follows: *E. histolytica* 4.1%, *E. coli* 20.5%, *E. nana* 13.5%, *I. bütschlii* 1.0%, *G. lamblia* 4.1% and *C. mesnili* 0.6%. The occurrence of protozoa was unusually light, the highest incidence of *E. histolytica* by community being 8.7%.

28. *An Epidemiologic Survey on Shikoku Island, Japan.* G. W. HUNTER III, L. S. RITCHIE, C. PAN, 406th Medical General Laboratory, M. YOKOGAWA, National Institute of Health, Tokyo, Japan.

A parasitological survey was made of all four prefectures of Shikoku, the fourth largest island of Japan. Intestinal parasites occurred in 94.8% of 1729 persons; 93.3% harbored helminths and 36.1% protozoa. Specific helminths and incidence were as follows: *Ascaris* 79.5%, whipworm 65.9%, hookworm 36.6%, *Trichostrongylus* sp. 3.8%, pinworm (by scotch tape) 68.5% *C. sinensis* 1.9%, *M. yokogawai* 7.2% and *P. westermani* 0.9%. *M. yokogawai* occurred with an incidence of approximately 20% in two communities, the greatest frequency reported in our series of surveys. In one community in Ehime Prefecture the incidence was 6.8%; 30.1% of 83 suspected cases were positive by stool, sputum or both. *Schistosoma japonicum* was not encountered.

The intensity of *Ascaris* and whipworm infections was relatively high as compared with other parts of Japan. Hookworm infections were essentially moderate or light and did not constitute a serious public health problem.

Occurrence of specific protozoa was: *E. histolytica* 6.8%, with a high of 12.8% in one community; *E. coli* 24.7%, *E. nana* 15.4% *I. bütschii* 1.4%, *G. lamblia* 3.7% and *C. mesnili* 1.1%.

Of 367 persons examined for malaria in Kochi Prefecture, none were infected. One case of filiariasis was encountered among 369 individuals.

29. *An Epidemiologic Survey of Shizuoka Prefecture, Japan.* L. S. RITCHIE, G. W. HUNTER III, R. E. FREYTAG, C. PAN, 406th Medical General Laboratory, Tokyo, Japan AND M. YOKOGAWA, National Institute of Health and Institute of Public Health and Welfare, Tokyo, Japan.

A survey was made of parasitism in Shizuoka prefecture during August and September 1950. Of special interest was the status of paragonimiasis, schistosomiasis and filariasis. A total of 2278 individuals were examined, of which 93.6% had intestinal parasites; 91.8% harbored helminths and 33.5% protozoa. *Ascaris* and whipworm occurred in 79.9% and 58.3%, respectively; the incidence of hookworm was 27.4% with a high of 54.8% in one community; the frequency of *Trichostrongylus* sp. was 8.7%; and pinworm (by scotch tape) was found in 56.4% of the children examined. *C. sinensis* and *M. yokogawai* occurred with an incidence of about 1%, but in one village the latter appeared in 7.7% of the people. The overall incidence of paragonimiasis was only 1.9%, but figures of 12.5 and 16.3% were obtained for two villages. Schistosomiasis was diagnosed for only 1.8% of the total examined; an incidence of 26% occurred in one village, but otherwise the frequency was 5% or less. On the basis of both human infections and snail population it appears that two small foci of schistosomiasis persist, one immediately north of Numazu City and the other at Sudo-Mura.

Intestinal protozoa were found as follows: *E. histolytica* 4.4%, *E. coli* 22.6%, *E. nana* 13.6%, *G. lablia* 4.1%, *C. mesnili* 0.2% and *I. bütschlii* 0.6%. In general, intestinal protozoa were lower than in other surveys in Japan.

Japanese literature includes reference to the occurrence of filariasis in the area of Yoshiwara, but from six adjacent vilages no microfilaria were found in 350 blood specimens examined by the Knott technique.

30. *The Survival of* Toxoplasma gondii *in Various Fluids.* Leon Jacobs, Frances E. Jones, and Marjorie L. Melton, National Institutes of Health, Bethesda.

For such purposes as the preparation of standard inocula of toxoplasmas for test animals, it was necessary to test various fluids for their ability to sustain these intracellular parasites without harm, and to ascertain reasonably safe time limits for handling them *in vitro.*

Suspensions of toxoplasma calculated to contain 10, 30, 50, or 100 organisms per 0.5 ml. were prepared in various fluids and tested for their infectivity to mice imediately after preparation and after standing for periods up to 24 hours at room or refrigerator temperatures, 23 to 28 degrees C. and 5 degrees C. respectively. Even after 2 hours at room temperature, inocula of toxoplasmas suspended in buffered saline lost most of their ability to produce infections in mice. After 4 to 6 hours in saline at room temperature, even inocula of 100 organisms failed to produce any infections in mice. Only slightly better viability of toxoplasmas was found in suspensions kept at 5 degrees C. The addition of 1 percent neopeptone broth or 10 percent serum to the saline resulted in a much more satisfactory suspending medium. Even after 4 or 5 hours at room temperature, suspensions of toxoplasmas in these fluids remained 100 percent infective to mice, and there was no appreciable lengthening of the survival time of mice inoculated with them. After 7 hours, some decrease in infectivity of the toxoplasmas in these media could be noted, as indicated by fewer deaths or prolonged survival time of the inoculated mice. However, even after 24 hours in serum-saline at room temperature an inoculum of 10 toxoplasmas was capable of killing 7 of 8 mice.

31. *Axenic* Neoplectana glaseri *in Fluid Cultures. Second Report.* Norman R. Stoll, Rockefeller Institute for Medical Research, New York.

If instead of development from 3rd stage larvae to adults, the criterion is numbers of organisms resulting from full-cycle development through more than one generation in the test tube, then prosperous cultures have required infusion broth supplemented with an extract of liver tissue. This extract, under usual conditions, is sensitive to heat, but if refrigerated retains its activity more than a year. After sterilization through a Seitz pad, it precipitates on standing. Activity accompanies the precipitate, and processing (as with heat) which reduces its amount gives a parallel reduction in the value of the supplement.

Using a standard test procedure with inocula of 25 larvae in 10 ml. media containing 10 per cent extract, and with attention paid to pH and temperature, 100 to 300-fold increases in worm population are expected in 3 weeks in tubes in the shaking machine in the dark.

32. *Retarded Growth of* Litomosoides carinii *after the Introduction of Non-living Antigenic Material into the Host.* J. Allen Scott and Etta Mae MacDonald, The University of Texas School of Medicine, Galveston, Texas.

We have previously shown that the growth of *Litomosoides carinii* in cotton rats with pre-existing infections is retarded as compared with that in previously uninfected control animals. The experiments reported here are attempts to duplicate this effect with non-living material which is supposedly of antigenic nature. Repeated subcutaneous introduction of frozen larvae in numbers up to 500 produced no effect on subsequent infections. The intraperitoneal introduction of dead adult worms either in the fresh or dried state produced a slight but significant measurable effect on subsequent infections. The results of experiments using the latter method are discussed in relation to the possible factors involved in this type of immunity. This work was supported in part by a research grant from the National Institutes of Health.

33. *The Relation of the Secretions and Excretions of the Larvae of* Nippostrongylus muris *to the Production of Protective Antibodies.* R. E. Thorson, The Johns Hopkins University.

The formation of precipitates at the body openings of many nematodes when placed in immune serum from their definitive hosts has been ascribed to the formation of antibodies against the secretions and excretions of the living worms. Protective antibodies have been demonstrated in immune sera but their relation to the *in vitro* precipitates is obscure. The following experiments were designed to test this relationship. Infective larvae of *Nippostrongylus muris* were isolated from cultures, carefully washed, and placed in normal rat serum. Streptomycin and penicillin were added to reduce bacterial and mold contamination. This mixture was shaken in

a 37° C. water bath for 24 hours. The larvae were then removed and the normal serum containing presumably their secretions and excretions was injected intraperitoneally into three four week-old rats in 0.1, 0.1, 0.2, 0.2, 0.3 and 0.3 cc. doses on alternated days. After a rest period of four days, the injected rats and littermate controls were each given 450 infective larvae subcutaneously and necropsied 8 days later. In three experiments following this procedure, the mean numbers of worms in the injected animals were 78, 102 and 92 as compared with 288, 200 and 250 in their respective controls. These differences were highly significant and were interpreted as indicating that protective antibodies were formed against the secretions and excretions of the worms.

34. *Regulation of Water Balance as a Function of the Excretory System of the Filariform Larvae of* Nippostrongylus muris *and* Ancylostoma caninum. Paul P. Weinstein, National Microbiological Institute, Bethesda, Maryland.

The rate of pulsation of the excretory ampulla of the filariform larvae of *Nippostrongylus muris* and *Ancylostoma caninum* was observed when the organisms were exposed to various concentrations of sodium chloride solutions; similar observations were also made of *N. muris* larvae in sucrose solutions. For both species in sodium chloride solutions ranging in concentration from zero (distilled water) to 1.7 percent, there was an inverse relationship between solute concentration and pulsation rate, which followed a straight line. Although the response was fundamentally the same for the two species, the ampulla pulsation rate of *N. muris* was approximately tenfold that of *A. caninum* in all concentrations tested. For *N. muris* larvae observed in sucrose solutions ranging in concentration from zero to 15 percent, the over-all result was the same as in saline with the exception that the pulsation rate was independent of the solute concentration between approximately 2 to 8 percent sucrose. Larvae exposed to the higher concentrations of sucrose in which pulsations almost ceased, showed within a short time after transfer to distilled water a rate (80.1 pulsations per minute) corresponding closely to the average value previously established for distilled water. It appears that the excretory system in these larvae is concerned with the regulation of water balance. By calculation, an *N. muris* larva in distilled water expels an amount of fluid equivalent to its body volume in 10.8 hours, while *A. caninum* does so in 74.9 hours.

35. *Chemical Observations on the Metabolism of the Larvae of* Trichinella spiralis. Theodor von Brand, Paul P. Weinstein, and Benjamin Mehlman, National Microbiological Institute, Bethesda, Maryland.

Sterile larvae of *Trichinella spiralis* consumed during starvation in a bacteria-free inorganic solution (modified Baldwin solution; periods up to 40 hours) approximately the same amount of glycogen aerobically and anaerobically (1.6 mg. glycogen per 100,000 larvae per 24 hours, corresponding to about 38 percent of the amount present initially). This glycogen was used fermentatively, both under aerobic and anaerobic conditions, leading to the appearance of volatile fatty acids in the medium. These were analyzed by chromatography and the largest fraction proved to be valeric acid. Smaller amounts of C_6, C_4, C_3, and C_2 acids were also found. Anaerobically, apparently no lipids disappeared from the larvae. Under aerobic conditions, on the contrary, starving larvae lost about 0.4 mg. lipids per 100,000 larvae per 24 hours, corresponding to about 21 percent of the amount present initially. It is probable that a relatively large fraction of the consumed oxygen serves to oxidize these lipids.

36. *Natural Infections of* Trichinella spiralis *in Skunks.* Lloyd A. Spindler and Donald O. Permenter, Zoological Division, U. S. Department of Agriculture.

So far as the writers are aware, there have been no previous reports of natural infections of trichinae in the skunk, *Mephitis mephitis*. Natural infections of trichinae were discovered during the past year in 3 of 4 adult skunks captured at the Zoological Division Station, Agricultural Research Center, Beltsville, Maryland. For examination, the carcasses were artificially digested and 3,741,800 and 235,570 trichina larvae, respectively, were recovered. No striking variations in size and other morphological characteristics of the larvae were observed. Some of the decapsulated larvae were administered to laboratory rats. Adult trichinae recovered 7 days after infection appeared normal. In the case of some rats in which the infection was permitted to persist for 30 days, no characteristics of the infection were observed which might lead to a conclusion that a distinct strain of the parasite was involved.

The source of infection of the skunks is problematical. However, for a number of years, investigations on trichinae have been conducted at the Station. During that period, scraps of trichinous meat have occasionally found their way into the sewers where wild rats, indigenous to the area, have frequently been observed. A number of these rats have been found infected with trichinae, the infections presumably having been acquired by consuming scraps of trichinous pork

picked up in the sewers. Presumably, therefore, the skunks acquired their trichinae as a result of consuming the carcasses of naturally infected rats.

37. *The Effect of Helminths on the Basement Membrane and Ground Substance of the Host: A Study of the Mechanism of Penetration.* R. M. Lewert and Chang Ling Lee, University of Chicago.

In passing through tissues of a vertebrate host parasites must pass the resistant acellular barriers of the basement membrane and the ground substance. The basement membrane forms a continuous sheet beneath most epithelia and is extended into areas of connective tissue as the ground substance. When altered or completely depolymerized by the action of enzymes, the alcohol and water soluble products of this depolymerization stain specifically after intravenous injection of Evan's blue. The alcohol and water insoluble polysaccharides also stain specifically with a microchemical technique described by Hotchkiss. The penetration and migration through tissues have been studied in *Trichinella spiralis, Nippostrongylus muris, Schistosomatium douthitti,* and *Schistosoma mansoni.* In the latter, the mechanism of penetration is enzymatic and causes immediate changes in the basement membrane and ground substance. Within fifteen minutes the cercariae penetrate the epidermis and come to rest on the basement membrane. Some of the cercariae by this time have caused the disappearance of the basement membrane in the immediate vicinity of their penetration. Within this period extensive changes take place with the formation of relatively large amounts of water and alcohol soluble products. Most of these changes take place within thirty minutes after the application of cercariae as after this time the cercariae are well within the dermis. The water and alcohol soluble polysaccharides are rapidly removed from the skin after their formation and within one hour after penetration can no longer be demonstrated.

38. *Further Studies on the Pathogenicity of* Nematodirus spathiger *and Development of Resistance to Reinfection.* K. C. Kates and J. H. Turner, U. S. Bureau of Animal Industry.

It was reported by us (J. Parasitol. 35 (6, sec. 2): 13) that infections of *N. spathiger,* induced by administration of 300,000 to 900,000 larvae over a 3-day period, caused diarrhea, anorexia, and retardation in growth of lambs, but no deaths. These effects were most marked during the second and third weeks after infection. Most of the worms were expelled during the second month after infection. Additional work on the effect of multiple infections is reported. In this study, 500,000 larvae were administered to each of 6 lambs over a 4-week period—100,000 as an initial dose and 50,000 semi-weekly thereafter. Two lambs were fed 500,000 larvae over a 3-day period as before. Three lambs multiple-infected, as well as the 2 lambs infected over a short period, were fed alfalfa hay in a pen. The other 3 lambs were grazed on pasture. Uninfected controls were maintained under like conditions.

The infections ran the usual course, as reported previously, in the 2 lambs fed larvae over a 3-day period. The clinical course of the infections was less severe in the multiple-infected lambs. Some diarrhea occurred in the alfalfa fed lambs, but only an occasional soft stool was seen in the pasture-fed lambs. It is concluded, from these observations and fecal egg counts, that resistance to reinfection develops rapidly in *N. spathiger* infections, and the most severe effects result when heavy infections are acquired by susceptible lambs over a short period of time.

39. *Preliminary Cytochemical Studies on Vitamin C in the Larvae of* Trichinella spiralis. W. L. Bullock, University of New Hampshire.

By use of the Bourne acetic acid/silver nitrate technique the cytochemical localization of Vitamin C (ascorbic acid) was studied in the larvae of *Trichinella spiralis.* The technique was applied to blocks of tongue and diaphragm for sectioned material, as well as to larvae digested free of their cysts.

Vitamin C was found to be present in conspicuous amounts in the intestine of the larvae. It was most pronounced in the mid gut region immediately behind the cell body. It diminished in quantity posteriorly. No evidence for the presence of Vitamin C was noted in other parts of the digestive tract or in the reproductive system.

This distribution of Vitamin C was observed in larvae from infections of 10 to 90 days duration. At 10 days, small amounts could be observed in the region of the developing gut. The maximum concentration was reached between 14 and 30 days. After this, there was a gradual decline until by 190 days only small quantities could be detected. No evidence of Vitamin C was found in the larvae in a rat sacrificed 338 days past infection.

Preliminary studies were made on the uptake of Vitamin C by larvae from a 28-day infection. Little change was noted in the intestinal pattern following incubation for 1 hour at 37° C. in 0.1% Vitamin C in neutral buffered physiological saline. Noticeable amounts, however, were found in the esophageal region of these incubated larvae.

40. *Effects of Fowl Ascarid Parasitism upon Host Resistance to a Bacterial Toxin.* J. E. Ackert, J. R. Egerton, and M. F. Hansen, Kansas State College, Manhattan.

Using growing chickens as hosts, the nematode *Ascaridia galli* as parasite and botulinus toxin (Type A) as the bacterial toxin, experiments were run on 242 chickens to determine effects of parasitism on the resistance of the hosts to the toxin. Moderate sized doses of 200 ± 10 *A. galli* eggs were given to each fowl of the groups to be parasitized. The dose of botulinus toxin injected per chicken was 0.015 mg. of toxin per kilogram of fowl body weight.

Criteria for judging effects upon the resistance were heart rate, weakness, inability to rise and death. Chickens parasitized and injected showed increased heart rate sooner than did those injected, but not parasitized.

At the level injected the unparasitized groups showed more morbidity and mortality than did the parasitized and injected groups.

The latter groups also had more worms than did those groups which were parasitized but uninjected. The difference was statistically significant. The toxin thus appeared to lower the resistance of the fowl host to the namatodes.

The data indicated that the growth in length of the female *A. galli* from the injected groups was retarded more than that of the male worms. The difference in length between the females of the injected and uninjected groups was significant beyond the one per cent level; whereas, this difference between the males of the two groups fell within the range of experimental error.

41. *On the Migratory Behavior of the Larvae of Various* Ascaris *Species in Mice.* J. F. A. Sprent, Ontario Research Foundation.

Mice were infected by feeding the embryonated eggs of the following ascarid species: *Ascaris lumbricoides* (pig), *Ascaris lumbricoides* (human), *Ascaris columnaris, Ascaris mustelarum, Parascaris equorum, Toxascaris leonina, Toxascaris transfuga* and *Toxacara canis.* The distribution of the larvae in the various tissues of the mice at daily intervals from one to fourteen days, as well as at three and four weeks after infection was investigated.

Two kinds of migratory behavior were observed, the first was manifested by most of the larvae of *A. lumbricoides* and *P. equorum* and consisted of migration through the liver, lungs and intestine followed by eventual disappearance of living larvae from the tissues of the mouse. The second type of migratory behavior was manifested by the larvae of the other species investigated, and resulted in more or less permanent infection of the rodent with encysted but living larvae. While the encysted larvae of *Toxacara canis, Ascaris columnaris,* and *Ascaris mustelarum* occurred mostly in the subcutaneous connective tissue and in tissues other than the intestines, many of the larvae of *Toxascaris leonina* and *Toxascaris transfuga* were encysted in the wall of the caecum and rectum.

The rate of migration and the rate of growth of the larvae appeared to be influential factors in deciding whether a tracheal type or a somatic type of migration predominated.

42. *Observations on Larval Carnivore Ascarids in Rodents.* Jack D. Tiner, University of Illinois.

The raccoon *Ascaris* has been shown to be consistently fatal to rodents in the laboratory because some of its larvae damage the brain (Tiner, J. Parasitol. 35: (Supp.) 13). *Ascaris columnaris* of skunks will also produce brain disturbances, but usually at least 30 days elapse between the time of infection and appearance of incoordination and paralysis. *Toxocara canis* of the dog (eggs collected by R. B. Williams, Alaska Department of Health, Juneau) reaches the brain in abundance, but produces no damage, in confirmation of the work of Fülleborn referred to in the previous note. One raccoon ascarid larva in the medulla or spinal cord of mice is fatal. Several skunk ascarid larvae in the central nervous system of a mouse may produce damage, but survival of infected mice and destruction of larvae in the brain is frequent. As many as 100 *T. canis* larvae may remain alive in a mouse brain 90 days without producing any noticeable symptoms in the animal. Growth rate and size maxima correspond to the damage produced in the brain. The raccoon ascarid grows more rapidly than the skunk ascarid, and to a larger size than either the skunk ascarid or *T. canis.* Few cysts on the caecum or colon are produced by the raccoon ascarid, and many are produced by the skunk ascarid. The latter reaches the brain about half as often as the former.

Eight of 12 wild fox squirrels from Champaign County woodlots of the University of Illinois contained encapsulated larval *Ascaris,* most probably from raccoons. A larval ascarid was found in the brain of a wild *Peromyscus leucopus* trapped in one of the woodlots, and 11 of 59 of these white-footed mice trapped in Illinois contained encapsulated larval ascarids in their viscera. When given via stomach tube in dosages of 250 larvae, a single raccoon ascarid larva has about 1 chance in 20 to reach the brain of the laboratory mouse. This probability can evidently be extrapolated unchanged to a hypothetical dosage of one larva per mouse. Exposure

to 15 or 20 larvae did not confer a detectable resistance to a second infection given 40 or 50 days later. Under field conditions, *A. columnaris* of raccoons is probably responsible for a measurable fraction of rodent mortalities. Data indicate that in the woodlots studied, this fraction may well be over 10 per cent of a particular rodent population.

An ascarid of badgers *Taxidea taxus* at the Jackson Hole Wildlife Park, Moran, Wyoming, (studied with a grant in aid from the New York Zoological Society) is distinguishable from *A. columnaris* because one egg in 25 is asymmetrical and 95 μ by 69 μ rather than 73 μ by 58 μ which is the usual size of the remainder of the *Ascaris* eggs in the badger and of *A. columnaris* eggs. One raccoon ascarid egg in several thousand measures 100 μ by 75 μ, is twice the volume of an ordinary *A. columnaris* egg, and produces a giant larva.

Toxacaris leonina from an Anchorage, Alaska dog encapsulated in the skeletal muscles of *Citellus richardsoni,* hamsters, and white mice. Almost no larvae were present in the viscera. Larvae were found most regularly in muscles of the abdominal wall, and none were found in the brain. This finding is consistent with the previously known lack of a lung migration in this species. Sprent's report (1951, J. Parasitol. 37: 326–327) that *Toxascaris transfuga* of bears has a lung migration and encapsulates in the large intestine and on the muscles of the neck and thorax of white mice is evidence in addition to morphological considerations indicating that the ascarid of the bear is no near relative of *T. leonina,* and belongs in a different, perhaps new, genus.

43. *Effects of Detergents on Embryogeny of* Ascaris lumbricoides *var.* suum. B. J. Jaskoski, The Creighton University.

A series of synthetic anionic wetting agents was found to have inhibitory effects on the cleavage of ova of *Ascaris suum.* Ten detergents in five per cent solutions were employed in the studies. Eggs were tested at 31° C. and at 38° C., tests being made on both normal and decoated ova (those with the protein and chitinous membranes removed with hypochlorite). In addition, four of the most effective detergents were tested in combination with one per cent phenol. In those detergents which normally contained no phenol, the latter combination resulted in an increased efficacy of the detergent. Duponol 80, Aresklene 400, Areskap 100, and Aresket 375 proved the most effective in the complete inhibition of cleavage. Preliminary observations on the mode of action indicated no apparent correlation between surface tension reduction and efficacy of the detergent in inhibiting cell division. The length of the alkyl chain and the complexity of the detergent mixture are apparently important factors in detergent activity. It appeared in these experiments that the most effective inhibitors of cleavage were those wetting agents which in some manner increased the permeability of the egg shell.

44. *A Survey of the Internal Parasites of the School Children of Bimini, The Bahamas, B.W.I.* Lyell J. Thomas, The University of Illinois and The Amer. Mus. Nat. Hist.

The first survey of the internal parasites of school children in the Bahamas was made at the Lerner Marine Laboratory of the American Museum of Natural History on Bimini, B.W.I., while the author was on sabbatical leave from the Zoology Department of the University of Illinois last spring. A total of 236 individual blood smears were taken, all of which proved negative for parasites. A total of 100 individual fecal examinations were made. Sixty-five girls ranging in age from 2 months to 19 years and 35 boys from 5 months to 11 years are here reported. Only 3 per cent were negative for any parasites. The totals for both sexes and all ages are as follows: 64 per cent *Ascaris lumbricoides,* 90 per cent *Trichuris trichiura,* 2 per cent hookworm, one per cent *Enterobius vermicularis,* 50 per cent *Entamoeba histolytica,* 3 per cent *Trichomonas,* and one per cent *Balantidium coli.* Factors influencing this distribution of the infections are discussed.

45. *The Trematode Family Microphallidae with the Report of a New Genus.* R. M. Cable and M. L. Kuns, Purdue University.

Life history studies of the microphallid trematodes and their remarkably uniform adult morphology in all respects except copulatory structures support the view that the presence or absence of a cirrus sac in this group does not justify its separation into two families, the Microphallidae and Maritrematidae, as Baer has done. On the contrary, it seems that the copulatory complex in this group is especially plastic and subject in very closely related forms to more varied and extreme modifications with loss of the cirrus and cirrus sac than in any other group in which this has occurred. The discovery of a new genus in a Mexican insect hawk affords yet another type of such modification in which the male papilla is lobed. Otherwise, the form is no different from species of *Microphallus. Spelotrema pseudogonotyla* is to be assigned to the new genus because of the bilobed male papilla; this distinguishes the species from the new one in which the papilla is trilobed.

46. *Parasites of the Amphibia. Trematoda. I.* A. C. WALTON, Knox College.

The following hosts and/or Trematode parasites have been added to the catalog since earlier publication:—1. *Alytes obstetricans* (Europe)—*larval Echinoparyphium recurvatum* (Linst., 1873) Dietz, 1909 and larval *Echinostomum revolutum* (Froel., 1802) Looss, 1899. 2. *Bufo americanus* (U.S.A.)—*Gorgodera amplicava* Looss, 1899. 3. *B. crucifer* (Brazil)—*Mesocoelium incognitum* Trav., 1921. 4. *B. d'orbignyi* (Paraguay)—*Gorgoderina cryptorchis* Trav., 1924. 5. *B. marinus* (Mexico)—*Gorgoderina megalorchis* Bravo Hollis, 1948. 6. *B. marinus* (Brazil)—*Choledocystus elegans* (Trav., 1926) Ruiz, 1949. 7. *B. paracnemis* (Paraguay)—*Catadiscus freitaslenti* Ruiz, 1943, *Gorgoderina parvicava* Trav., 1921 and *Mesocoelium incognitum.* 8. *Chthonerpeton indistinctum* (Uruguay)—*Glypthelmins sera* Cordero, 1944. 9. *Crinia signifera* (Australia)—*Cercaria angelae* Johnston & Simpson, 1944 (enter tadpoles) and *Cerc. ellisi* J. & S., 1944 (enter tadpoles). 10. *Eurycea bislineata bislineata* (U.S.A.)—*Phyllodistomum solidum* Rankin, 1937. 11. *E. tynerensis* (U.S.A.)—*Sphyranura euryceae* Hughes & Moore, 1943. 12. "Frogs" (Europe)—larval *Distoma atriventre* Weinland, 1856 and *Halipegus ovocaudatus* (Vulp., 1859) Looss, 1899. 13. "Frogs" (Japan, Phil. Is.)—larval *Echinoparyphium recurvatum.* 14. "Frogs" (S. Africa)—larval *Distoma luteum* Gilchrist, 1918. 15. "Frogs" (U.S.A.)—*Cercaria merchanti* Rankin, 1939 (enter tadpoles) and *Cerc. pricei* Rothchild, 1940 (enter tadpoles). 16. "Frogs" (Venezuela)—*Haematoloechus lutzi* Freitas & Lent, 1939. 17. *Hemipipa carvalhoi* (Brazil)—*Catadiscus mirandi* Freitas, 1943. 18. *Hyla versicolor* (U.S.A.)—*Gorgodera amplicava* (metacercariae in tadpoles and adults). 19. *Leptodactylus ocellatus* (Brazil)—*Choledocystus elegans.* 20. *L. ocellatus* (Paraguay)—*Catadiscus freitaslenti, C. inopinatum* Freitas, 1941 and *Glypthelmins palmipedis* Lutz, 1925.

Parasites of the Amphibia. Trematoda. II. A. C. WALTON, Knox College. 21. *Leptodactylus ocellatus* (Uruguay)—*Plagiorchis lenti* Freitas, 1941. 22. *Megalebatrachus japonicus* (China)—*Bucephalopsis kweiyangensis* Chu, 1950. 23. *Molge palmata* (Europe)—larval *Echinoparyphium recurvatum* and larval *Echinostomum revolutum.* 24. *Proteus anguinus* (Yugoslavia)—*Plagioporus protei* Prudhoe, 1945. 25. *Rana amurensis* (Siberia)—*Haematoloechus schulzei* (Wundsch, 1911) Ingles, 1933 and *H. sibericus* (Isait., 1927) Freitas & Lent, 1939. 26. *R. clamitans* (U.S.A.)—*Loxogenoides bicolor* (Krull, 1933) Kaw, 1945. 27. *R. esculenta* (Europe)—larval *Echinostomum revolutum.* 28. *R. montezumae* (Mexico)—*Halipegus amherstensis* Rankin, 1944. 29. *R. pipens* (Mexico)—*Langeronia macrocirra* Caballero & Bravo Hollis, 1949. 30. *R. pipiens brachycephala* (U.S.A.)—*Gorgodera amplicava.* 31. *R. sphenocephala* (U.S.A.)—*Halipegus occidualis* Stafford, 1905. 32. *R.* sp? tadpoles (China)—metacercariae of *Centrocestus formosanus* (Goto in Nishigori, 1923) Price, 1932. 33. *Rhyacosiredon altamirani* (Mexico)—*Phyllodistomum rhyacosiredonis* Bravo Hollis, 1943. 34. Salamander larvae (U.S.A.)—larval *Macroderoides typicus* (Winfield, 1929) Van Cleave & Mueller, 1932. 35. *Siphonops annulatus* (Brazil)—larval *Distoma monas* Rud., 1819. 36. "Tadpoles" (Africa)—larval *Kasr pleurolophocerca* (Sons., 1884) Khalil, 1932. 37. "Tadpoles" (Australia)—larval *Echinoparyphium ellisi* Johnston & Simpson, 1944 and larval *Echinostomum revolutum.* 38. "Tadpoles" (Europe)—larval *Distoma nigrans* Duj., 1845, larval *Echinostomum revolutum,* larval *Lecithopyge ranae* (Froel., 1791) Perkins, 1928, larval *L. rastellum* (Olsson, 1876) Perkins, 1928 and larval *Zeugorchis signatus* (Duj., 1845) Walton, 1938. 39. "Tadpoles" (Japan)—larval *Echinostomum hortense* Asada, 1927 and larval *E. revolutum.* 40. "Tadpoles" (Manchuria)—larval *Echinostomum campi* Ono, 1930.

Parasites of the Amphibia. Trematoda. III. A. C. WALTON, Knox College. 41. "Tadpoles" (U.S.A.)—*Cercaria compactisoma* Byrd & Reiber, 1940, *C. ranae* Cort & Brackett, 1938, *C. welleri* McMullen, 1938, larval *Echinostomum revolutum,* larval *Euparyphium melis* (Schrank, 1788) Dietz, 1910, larval *Fibricola texensis* Chandler, 1942, larval *Macroderoides typicus,* larval *Neorenifer kansensis* (Crow, 1913) Byrd & Denton, 1938, larval N. sp? (of McCoy, 1928) Walton, 1938, larval *Pneumatophilus variabilis* (Leidy, 1856) Odhner, 1910 and *Telorchis medius* Stunkard, 1916. 42. "Tadpoles" (Venezuela)—larval *Echinostomum revolutum.* 43. "Toad" (Europe)—larval *Euryhelmis squamula* (Rud., 1819) Poche, 1925. 44. "Tree-frog" tadpoles (Brazil)—larval *Strigea vaginata* (Brandes, 1888) Strong, 1926. 45. *Xenopus laevis* (S. Africa)—*Diplostomulum xenopi* Nigrelli & Maraventano, 1944 (in heart).

Other records added are as follows:—NEMATODA: 1. *Bufo bufo asiaticus* (China)—*Paracosmocerca mucronata* Kung & Wu, 1945. 2. *B. horribilis* (Mexico)—*Aplectana incerta* Caballero, 1949, *Oswaldocruzia subauricularis* (Rud., 1819) Trav., 1917 and *Rhabdias sphaerocephala* Goodey, 1924. 3. *Discoglossus pictus* (Europe)—Encapsulated larvae of *Synhimanthus spinulatus* Chabaud, 1950. 4. *Microhyla ornata* (China)—*Paracosmocerca mucronata* and *Rhabdias globocephala* Kung & Wu, 1945. 5. *Rana clamitans* (U.S.A.)—larval *Spiroxys contortus* (Rud., 1819) Schn., 1866. 6. *R.* spp? (China)—*Paracosmocerca mucronata.* ACANTHOCEPHALA: 1. *Desmognathus fuscus* (U.S.A.)—larval *Acanthocephalus* sp? of Rankin, 1937. 2. *Megalobatrachus japonicus* (Japan)—*Acanthocephalus lucidus* Van Cleave,

1925 and *A. nanus* Van Cleave, 1925. ANNELIDA: 1. *Hyla squirella* (U.S.A.)—*Schmardiella hylae* Goodchild, 1951. MOLLUSCA: 1. *Rhacophorus* sp? tadpoles (India) and 2. *Rana* sp? tadpoles (India)— glochidia of *Mytilus* sp? embedded in non-pigmented areas.

47. Brachylaima condylura, *n. sp., from the Star-nosed Mole,* Condylura cristata. THERON O. ODLAUG, University of Minnesota, Duluth Branch.

Nine sexually mature specimens were found in the intestine of a star-nosed mole taken on the campus of the Duluth Branch of the University of Minnesota. Extension of the vitellaria to the posterior end of the body, greater diameter of acetabulum as compared with oral sucker, and larger egg size differentiate *Brachylaima condylura* from previously described species. The generic name *Brachylaima* Dujardin, 1843, is used rather than *Brachylaemus* as emended by Blanchard (1847), in accordance with Opinion 148 of the International Commission of Zoological Nomenclature. The present report is the first of the mole as a host for the genus *Brachylaima* and is apparently the first report of the genus from an insectivore in the United States.

48. *Some Factors Involved in the Hatching of* Hymenolepis diminuta *Onchospheres.* W. MALCOLM REID, LOREN ALLAMAN, AND FRANK FITCH, Monmouth College.

Hatching of *Hymenolepis diminuta* onchospheres under natural conditions involves three distinct steps. The outer, golden-yellow membrane is comparatively brittle and easily ruptured mechanically. As observed by a system of mirrors and a microscope the mandibles of beetle intermediate hosts break the outer membrane of most onchospheres as they enter the mouth. Artificial rupture of this outer membrane for *in vitro* studies is readily accomplished by concentrating the eggs in a small drop of water and bouncing a dissecting needle up and down in the center of the drop. The inner membrane which closely surrounds the onchosphere is more elastic and not broken by mechanical action. Although the outer membrane is not digested, the inner membrane is affected by the action of pancreatin after the outer membrane has been broken mechanically. Hatching is due to: first, a mechanical cracking of the outer membrane; second, digestion of the inner membrane; and third, the direct action of the six hooks which free the embryo from membrane debris. The hooks are usually stimulated to violent activity after the outer shell is cracked, but are unable to break out of the inner membrane unless assisted externally by digestive enzymes.

49. Diphyllobothrium latum *in the Dog.* M. S. FERGUSON, Communicable Disease Center, Public Health Service, Atlanta, Ga.

Twenty-one out of twenty-five dogs became infected with *Diphyllobothrium latum* when fed plerocercoids from great northern pike and walleyes taken at Ely, Minnesota and Winnipeg, Manitoba. The number of plerocercoids fed to individual dogs varied from three to fifteen. The largest number of adult tapeworms recovered from any animal was three and in one dog fed only four plerocercoids three tapeworms were found. The duration of the infections varied from as short a time as eighteen days up to nearly seven months. Eight animals retained their tapeworms for periods ranging from two and a half to four and a half months. Up to eighty-five percent of the eggs of *D. latum* recovered from dog feces, or from proglottids of tapeworms maturing in dogs, hatched when placed in tap water and incubated at room temperature for six to ten days. The hatching rate of eggs from the proglottids of two tapeworms recovered from one dog differed significantly; the rate being five percent for eggs from the first worm and seventy-five percent for the second. Coracidia hatching from eggs recovered from proglottids, as well as from dog feces, were infective for several species of *Diaptomus.*

50. Diphyllobothrium latum *Indigenous in the Lake District of Chile.* ERNEST CARROLL FAUST, Tulane University; AMADOR NEGHME R., Universidad de Chile, AND ISAÍAS TAGLE V., Universidad de Chile.

This fish tapeworm has been found in native residents on several lake shores about 40° S. Latitude; likewise as a natural infection in dogs of the district. None of the human cases had ever lived or traveled in endemic areas outside Chile. The only fish host thus far incriminated in *Salmo irideus,* which was introduced years ago from the United States. Spargana from these infected fishes fed to experimental dogs in Santiago produced mature worms. Morphologically the worms from natural and experimental infections are indistinguishable from *D. latum* originating from Switzerland, Canada and the United States.

51. Phlebotomus *spp. as Related to Leishmaniasis.* MARSHALL HERTIG, Gorgas Memorial Laboratory, Panama.

52. *Vectors of Onchocerciasis in Guatemala.* HERBERT T. DALMAT, Laboratory of Tropical Diseases, National Institutes of Health, and Pan American Sanitary Bureau.

53. *Vectors of* Diphyllobottrium *spp.* LYELL J. THOMAS, University of Illinois.

54. *Snail Vectors of* Schistosoma japonicum *in the Philippine Islands and Japan.* DONALD B. MCMULLEN, School of Medicine, University of Oklahoma.

55. Pomatiopsis lapidaria, *Its Occurrence in the Washington, D. C., Area and Its Laboratory Rearing in Comparison with that of* Oncomelania *spp.* WILLIAM B. DEWITT, Laboratory of Tropical Diseases, National Institutes of Health.

56. *Livestock Parasitology in the United States.* BENJAMIN SCHWARTZ, Zoological Division, U. S. Bureau of Animal Industry.

57. *Comparative Morphology of Some Rat Flea Larvae* (*Siphonaptera*). ROBERT E. ELBEL, Communicable Disease Center, Public Health Service, Federal Security Agency, Atlanta, Georgia.

Four species of fleas: *Xenopsylla cheopis, Echidnophaga gallinacea, Leptopsylla segnis* and *Polygenis gwyni* were reared on the appropriate host in individual metal containers with sand and sawdust as bedding. Their larvae were recovered from the bedding, described, illustrated, and compared with the larvae of *Ctenocephalides felis, Nosopsyllus fasciatus, Orchopeas sexdentatus,* and *O. leucopus,* all of which the author had studied previously (Elbel, 1951, Jour. Parasitol.). A chart is presented which illustrates the most common species of rat flea larvae and can be used to identify the majority of flea larvae recovered from domestic rat nests in the United States.

Echidnophaga gallinacea, family Hectopsyllidae, is readily recognized since it lacks the long setae on the head and the first twelve body segments so common in the other species studied. *Xenopsylla cheopis* and *Ctenocephalides felis,* both of the family Pulicidae, are similar in that both have an anal comb consisting of one row of straight setae rather than the typical double overlapping row. *Leptopsylla segnis,* family Hystrichopsyllidae, differs in that one of the seta on each of the first twelve body segments is short rather than long. The other four species which belong to the Dolichopsyllidae are separated by the chaetotaxy of the head and the thirteenth body segment. Perhaps study of more flea larvae will show some of these broad differences and similarities to be family characters.

58. *A Species of* Alaria *from the Marten* (Martes a. americana). J. C. PEARSON (Introduced by A. M. FALLIS, Ontario Research Foundation, Toronto).

59. *A Species of* Dirofilaria *from the Black Bear* (Euarctos a. americanus). R. C. ANDERSON (Introduced by J. F. A. SPRENT, Ontario Research Foundation, Toronto).

60. *Exo-erythrocytic Stages of* Plasmodium falciparum. G. M. JEFFERY, G. B. WOLCOTT, M. D. YOUNG, National Institutes of Health, Public Health Service; D. C. Williams, Jr.

A volunteer was given massive inoculations of *Plasmodium falciparum* sporozoites by the bites of infected mosquitoes and the injection of infected glands over a period of four days. Liver biopsy was taken 3 days after the last inoculation. The tissue was fixed in Carnoy's sectioned at 6 microns, and stained in colophonium Giemsa. Parasites representing different stages of development were found in parenchyma cells.

61. *Studies in the Use of Mucoids by* Clinostomum marginatum. FRANCIS J. KRUIDENIER, The University of Illinois.

It has been demonstrated (Kruidenier) that a complement of mucin glands forms in close association with the penetration glands during the embryogeny of the cercariae of *Clinostomum marginatum* and that certain of these glands are retained, apparently unchanged, in emerged cercariae while others of the complement discharge during the emergence of the cercariae from *Helisoma trivolvis.* So far as can be determined none of the mucoid glands discharge during the free existence of the cercariae.

Entire guppies, fixed in Bouin's medium, were sacrificed at frequent intervals during and after exposure to the cercariae of *C. marginatum* and serial sections were treated with metachromatic dyes to determine the distribution of mucoid substances. In such experimental infections a portion of the mucoid is discharged during initial penetration activities and fine but distinct metachromatic films completely surround the bodies of the cercariae. Such mucoid is closely applied to the surfaces of the cercariae in a distinct layer. Presumably this extrusion of mucoid accompanies the discharge of the histolytic penetration glands but the techniques employed do not adequately differentiate the latter and the actual activity of the penetration gland substances can not be followed.

The presence of the mucoid glands in cercariae migrating in guppy tissues and the persistence of the metachromatic film indicates the continued use of the glands and may indicate the resumption of mucoid formation by the glands of post-penetrant cercariae.

62. *The Procercoid Larva of* Lacistorhynchus tenuis (van Ben. 1858). NATHAN W. RISER, Fisk University.

Free onchospheres of the tetrahynch cestode *Lacistorhynchus tenuis* are present in the haemocoele of *Tigriopus fulvus* (Fisher) one and one-half hours after the copepod begins to feed on the coracidia. Growth is rapid. The seven-day old procercoid is cigar-shaped but no cellular nor morphological differentiation has occurred. At thirteen days, the cuticle is formed. Chalk-bodies begin to appear after the fourteenth day and the excretory vessels appear after the sixteenth day. By the eighteenth day, the anterior end is invaginated. No appreciable increase in size occurs after the thirteenth day. The oldest specimens which were studied were forty-one days old. No scolex, as such, occurs in the procercoid. This structure arises in the plerocercoid stage. Living specimens were never observed to have a cercomere, but larvae retrieved from fecal casts from experimental second intermediate hosts showed a cercomere-like differentiation of the posterior end of the body.

63. *The Toxicity of Tetravalent Tin Compounds for Chickens.* K. B. KERR AND A. W. WALDE, Dr. Salsbury's Laboratories.

The toxicity data obtained from the screening tests conducted on more than 50 tetravalent tin compounds will be presented. These compounds are represented by the formula $R_{4-n}SnX_n$ where R is an alkyl, aryl or aralkyl radical and X is oxygen, sulfide or an anion of the commonly known inorganic and organic acids and n is 1, 2 or 3.

These data indicate that the R radical is of greater relative importance in the question of toxicity for the chicken than is the X radical.

64. *Human Case of Sarcocystosis from the Congoes.* OSCAR FELSENFELD, Hektoen Institute of Cook County Hospital, Chicago.

65. *Hermaphroditic Female* Schistosomatium douthitti. ROBERT B. SHORT, Florida State University.

Although hermaphroditic male *Schistosoma mansoni* have been reported (Vogel, 1947; Short, 1948; Gönnert, 1949; Lagrange and Scheecqmans, 1949), the writer knows of no reports of hermaphroditism in female schistosomes. It was, therefore, with interest that testicular follicles were discovered in certain female *S. douthitti* recovered from laboratory-reared, experimentally infected deer mice (*Peromyscus maniculatus*). Over 1350 stained female worms (650 from unisexual and 700 from male-female infections) were examined, and testicular follicles were observed in 21 specimens aged 11 to 150 days. Eighteen hermaphrodites were from male-female infections; 3 were from unisexual infections. The testes in these worms lie posterior to the ovary between the intestinal caeca; they vary in size and shape, have no efferent ducts, and all are immature.

Except for testicular follicles, 11 of the 21 females appear normal in all other respects. The remaining 10 possess abnormalities other than testes, such as decreased body-size, reduction in development of vitellaria and abnormal orientation of ovary.

Factors favoring such hermaphroditism in *S. douthitti* are not known.

66. *The Cultivation of* Trypanosoma cruzi *in Egg Yolk Infusion Medium.* MAX C. MCCOWEN, C. ROSALIND MAYNARD AND MAURICE E. CALLENDER, Lilly Research Laboratories, Indianapolis, Indiana.

An improved egg yolk infusion medium was reported by Balamuth (1946) for the cultivation of *Endamoeba histolytica* and other intestinal protozoa. We have found the egg yolk infusion medium to support the growth of *Trypanosoma cruzi.*

10 ml. of medium inoculated with 0.2–0.4 ml. of blood taken aseptically from a young rat infected with *T. cruzi* has maintained this species of hemoflagellate for 30–146 days. The cultural forms of the parasite have been infective for laboratory animals.

Those investigators culturing *E. histolytica* in the egg yolk infusion medium may find it more convenient to use a single medium for intestinal protozoa and hemoflagellates.

67. *Causative Agents of Swimmer's Itch in Narragansett Bay, Rhode Island.* HORACE W. STUNKARD, New York University.

For several years swimmers and clam diggers in Narragansett Bay have reported a severe dermatitis. The Rhode Island State Department of Health, through Mr. Malcolm Hinchliffe,

has collaborated in a study of the causative agents. Incidence of infections appears to be sporadic; it was serious in 1949, mild or absent in 1950, heavy in 1951. Examination of snails from infectious beaches disclosed in *Nassa obsoleta* furcocercous cercariae which caused swimmer's itch in sensitized persons and which developed into dioecious schistosomes in experimental birds. The larvae are similar to and almost certainly identical with *Cercaria variglandis* Miller and Northup, 1926. The adults are probably natural parasites of migrant shore-birds. Their morphology, life-cycle, and systematic position will be discussed.

68. *Some Observations on the Blood of the Hamster Infected with Leishmaniasis.* L. A. Stauber and D. G. Gemeroy, Rutgers University.

Even in terminal visceral leishmaniasis, hamster serum gives no positive aldehyde test. Infected hamsters fed a purified diet rarely die with edema and their sera are only slightly more opalescent than normal hamster sera. About half the infected animals, fed a stock commercial diet, develop a terminal anasarcous edema. The sera of most of the edematous infected hamsters and of some on the same diet but without edema are often highly opalescent. This opalescence is not removed by cold ether or Bloor's extraction. Serological comparisons of normal and infected hamster sera were made in a turbidimetric precipitin-testing system(Photronreflectometer) using antibodies against normal and infected hamster serum. In almost all serological comparisons the homologous test gives the greatest amount of reaction. However, infected hamster serum (antigen) x anti-normal (antibody), has shown significantly greater reactivity than the homologous (normal x anti-normal). In the reciprocal tests using anti-infected antibody, the infected x anti-infected test gave significantly greater reactivity though this is the homologous test. Infected hamster serum is, therefore, a more reactive antigen in terms of the turbidimetric comparison than normal hamster serum. Serum protein concentration in the normal and infected sera can not explain this. Alteration in the reactivity of one or more serum fractions or in the relative concentration of the fractions are possible explanations. Both non-opalescent and opalescent infected sera show this greater reactivity. Thus no correlation between the opalescence and the heightened reactivity is noted.

69. *Ecology of Worm Parasites in Salamanders from South-Central New York.* Jacob H. Fischthal, Harpur College, State University of New York, Endicott, New York.

In a survey of salamander parasites during the periods from July 19—September 17, 1950 and May 25–July 8, 1951 from 24 different collection points in 5 counties of south-central New York 503 salamanders were examined and 220 or 43.7 percent were infected with at least one species of helminth parasite. Hosts examined were 105 *Triturus v. viridescens,* 1 *Ambystoma jeffersonianum,* 36 *Plethodon c. cinereus,* 25 *Plethodon g. glutinosus,* 24 *Gyrinophilus p. porphyriticus,* 134 *Eurycea b. bislineata,* and 178 *Desmognathus f. fuscus.* The variation in numbers of different host species examined is indicative of their relative abundance in the area studied. Tentative identifications of parasites encountered indicates 10 species of trematodes, 3 of cestodes, and 9 of nematodes. The incidence and intensity of infection, and the number of parasite species present are determined by the habits and habitat preferences of the salamanders which bring them in close proximity with the essential stages in the parasite life-cycle, by the degree of host-specificity exhibited by the parasite, and by the physical condition of the habitat of the host. In general, the incidence and intensity of infection, and the number of parasite species found are greatest in the aquatic *T. v. viridescens,* whereas they are least in the terrestrial *P. c. cinereus* and *P. g. glutinosus;* the terrestro-aquatic *G. p. porphyriticus, E. b. bislineata* and *D. f. fuscus* maintain an intermediate position.

70. *The Effect of Some Pyridine and Piperidine Compounds on Horse Strongyle Larvae in Manure.* Norman D. Levine, University of Illinois.

In a study of the effect on horse strongyle larvae of pyridine and 38 of its derivatives and of piperidine and 18 of its derivatives, nicotine sulfate was found to be by far the most active compound. It killed all larvae in manure in a concentration of 0.00038 M. Compounds which were inactive in a concentration of 0.01 M. (the highest concentration tested) were pyridine and 21 of its derivatives and piperidine and 15 of its derivatives. Six complex pyridine derivatives of uncertain structure and molecular weight were inactive at a concentration of 1%. The more active compounds included 2-vinylpyridine, *sym*-di-(pyridyl-2) ethane, and the sulfates of mixed dipyridyls from 2-methylpyridine, which killed all larvae in a conectration of 0.005 M. The mixed dipyridyls from 2-methylpyridine and N-*n*-dodecylpiperidine killed all larvae in a concentration of 0.0025 M. When the saturated piperidine ring was substituted for the unsaturated pyridine ring of nicotine, the resultant compound, hexahydronicotine, was inactive.

71. *Tetravalent Tin Compounds as Anthelmintics.* K. B. Kerr and A. W. Walde, Dr. Salsbury's Laboratories.

More than 50 tetravalent tin compounds were subjected to screening tests to determine whether they possess anthelmintic value against *Raillietina cesticillus* of chickens using the controlled test. The activity of the compounds against *Ascaridia galli* was also studied.

The compounds may be represented by $R_{4-n}SnX_n$ where R is an alkyl, aryl or aralkyl radical and X is oxygen, sulfide or an anion of the commonly known inorganic and organic acids and n is 1, 2 or 3.

Because of the large number of compounds to be tested the number of birds used for each test was small, only four birds being used per dosage. The compounds were administered both as a single dose by capsule and as a feed medication. Standard dosages were used throughout, thus permitting a comparison of the activities of the compounds.

The results of these tests indicate that many of the compounds are highly efficacious against *Raillietina cesticillus*. A somewhat higher dosage is required to cause an equivalent removal of *Ascaridia galli*.

72. *Chemotherapeutic Studies of Natural Pinworm Infestations in Mice with Reference to Screening for New Antioxyurid Agents.* J. W. Reinertson and Paul E. Thompson, Parke, Davis and Company.

Observations on the incidence and intensity of natural infestations of *Syphacia obvelata* and *Aspiculuris tetraptera* in a colony of white mice showed such infestations provided convenient test material for chemotherapeutic studies. Eighteen compounds, including most of those variously recommended for the treatment of human oxyuriasis, were tested for information on the validity of mouse infestations in screening for new agents. Drugs were administered in the diet or by oral intubation and the effects of therapy were measured by the complete eradication of pinworms in the cecum and large intestine. Gentian violet, crystal violet, phenothiazine, hexylresorcinol and tetrachlorethylene were effective against both species. The dose-response relationships of gentian violet and probably that of crystal violet were dissimilar for the two species. Carbon tetrachloride was active against *A. tetraptera* but did not eradicate *S. obvelata*. Thymol, santonin, para-benzylphenyl carbamate and 9 compounds not commonly considered as vermifuges failed to eradicate either species.

73. *Results of Feeding Small Amounts of Phenothiazine during the Prepatent Period of the Nodular Worm of the Calf.* Roy L. Mayhew, Louisiana State University.

The results of 5 experiments in which 1½ gm. of phenothiazine was fed daily in the grain ration during the first 28 days after inoculation resulted in one calf remaining negative and the other 4 developing only a very low egg count. Six experiments in which 1½ gm. was fed from the 15th to the 28th day resulted in 3 negative animals and 3 with very low egg counts. One animal fed 1½ from the 15th to the 28th day developed a normal egg count. Two animals fed 1½ grams during the first 14 days of the prepatent period became positive on the 38th day, one developed a rather high egg count and the other a low. Animals receiving the drug during last part of the prepatent period began producing eggs considerably later than normal, the first eggs appearing after the 53rd day and two animals remaining negative at least 70 days. The normal prepatent period is from the 32nd to the 43rd day.

74. *Skin-tests for Paragonimiasis with Antigen from Adult Worms of* Paragonimus westermani. L. S. Ritchie, G. W. Hunter III, C. Pan, 406th Medical General Laboratory, Tokyo, Japan and M. Yokogawa, National Institute of Health and Institute of Public Health and Welfare, Tokyo, Japan.

A group of 87 persons infected with paragonimiasis and 30 negative controls were skin-tested intradermally with a merthiolated saline extract of the adult worms of *Paragonimus westermani*. Antigen preparation followed the usual procedures of freezing and thawing, and lyophilization under relatively aseptic conditions. The dried product was stored at −50° C. and extracts were tested for sterility prior to use. Dilutions of 1 : 5000, 1 : 10,000 and 1 : 20,000 were compared. An increase of at least 3 mm. in wheal diameter in excess of the merthiolated saline control was interpreted as a positive reaction. Readings were made 12–15 minutes after injection.

Approximately 95% of the paragonimiasis cases gave positive reactions with single tests. No significance could be given to the minimal differences resulting from the three antigen dilutions; however, wheal sizes averaged slightly less with the 1 : 20,000 dilution. Of the 30 negative controls, 2 gave false positive reactions with the 1 : 5000 dilution, whereas all were negative with the two higher ones. Although the 1 : 20,000 extract gave good results, the 1 : 10,000 seemed preferable.

75. *Acquired Immunity in Mice Infected with* Schistosomatium douthitti (Cort) (*Trematoda: Schistosomatidae*). Irving G. Kagan, The University of Chicago.

Immunity to superinfection was acquired by mice (CF1, Carworth Farms strain) against *Schistosomatium douthitti* 30 to 120 days after an initial infection as ascertained by the recovery of schistosomes from cercariae exposed 17 to 23 days earlier. Of 50 cercariae, which constituted the challenging infection, only 27.03 ± .778% were recovered in 50 experimental mice as compared to 54.22 ± .925% in 54 controls. Immunity is increased by repeated infection at 5 to 6 day intervals for several weeks with small numbers of cercariae. With a similar challenging infection 15.92 ± 1.55% of the cercariae were recovered in 11 experimental mice as compared to 51.38 ± 2.22% in 10 controls. Both male and female worms developing from the challenging infection are reduced in number and stunted in growth.

An initial infection of female worms produced a similar acquired immunity to superinfection when tested 60 and 121 days after infection. A total of 41.29 ± 1.68% of the cercariae in the challenging infection were recovered in 17 experimental mice as compared to 64.04 ± 1.59% in 19 controls. The appearance and size of male worms recovered in experimental mice were normal.

An initial infection of male schistosomes produced a slight immunity to superinfection when challenged 15 to 168 days after infection. Whereas, the number of schistosomes developing from the challenging infection in 11 of 12 experiments with 71 experimental and 62 control mice does not differ significantly compared to controls, the growth of male worms is stunted but females develop normally.

A total of 31 experiments with 178 experimental and 168 control mice were made in this study.

76. *The Influence of Previous Infection of Mice with* Schistosoma mansoni *on a Challenging Infection with the Homologous Parasite.* M. A. Stirewalt, Naval Medical Research Institute, Bethesda, Md.

Mice previously infected with either or both sexes of *Schistosoma mansoni* were presented a challenging infection under a variety of conditions with the following results. When larvae from the initial exposure were present in the host skin, penetration by the cercariae of the challenging infection was inhibited with consequent reduction in the number of worms which matured from them. If the schistosomulae which developed from the first infection were migrating through the host or had just reached the portal system at the time of the second exposure, a normal proportion of the latter cercariae penetrated and matured. On the other hand, if the host had a mature infection with ova as well as adult worms when the challenging infection was presented, there was an apparent reduction in the number of worms developing from the second infection in spite of the fact that penetration had not been inhibited.

77. *Distribution and Periodical Activity of Chiggers Near Duke University.* G. W. Wharton, Duke University.

The local distribution of *Trombicula alfreddugèsi* seems to be largely dependent on both soil and cover type. Thicket on sand was the most favorable habitat found. Seasonal occurrence of chiggers depends largely on temperature. They are active near Duke University from April to November reaching a peak in July. Diurnal periodicity was also found to be determined by temperature.

78. *The Free Amino Acids in the Whole Bodies of Culicid Mosquitoes.* Edgar W. Clark and Gordon H. Ball, University of California at Los Angeles.

Culex stigmatosoma, Culex tarsalis, Culiseta incidens, and *Aedes varipalpus* were analyzed to determine the free amino acids in the body tissues by the two dimensional ascending paper partition chromatographic technique of Williams and Kirby. Starved adult mosquitoes, reared from larvae collected in the field, were homogenized, and the homogenate deproteinized, filtered, and finally the filtrate reduced in volume to about 100 λ. The separations were carried out on 15 by 15 inch and 6 by 7 inch sheets of Whatman #1 filter paper. (It was found that with care the 6 by 7 inch sheets will give excellent results.)

The following acids were found in all four species: alanine, arginine, glutamic acid, glycine, methionine, phenylalanine, proline, serine, threonine, valine, and plutamine. Aspartic acid, cysteine and/or cystine, histidine, lysine, tryptophane, and α-amino-n-butyric acid were found in many but not in all cases. Among those which were either absent or in concentrations too low to be detected were leucine and/or isoleucine although these were found consistently in the blood of insects analyzed by other workers. If leucine and/or isoleucine are necessary for growth, then the absence of those acids in *A. varipalpus* may explain Greenberg's observations that in *A. aegypti* partial oviposition occurred with an isoleucine meal even in the absence of blood. Tyrosine was absent in the species of *Culex* and in *Culiseta incidens,* but was present in *Aedes Varipalpus.* This absence is unusual not only because it has been found consistently in other insects but also because it is considered the basic building block in the tanning of insect integument.

79. *The Relationship of* Culicoides (*Diptera, Ceratopogonidae*) *to the Transmission of* Onchocerca volvulus. Colvin L. Gibson, National Institutes of Health and Pan American Sanitary Bureau and Werner F. Ascoli, Pan American Sanitary Bureau.

Three anthropophilic species of *Culicoides* have been found in the San Pedro Yepocapa region of the onchocerciasis zone in Guatemala. These are *C. paraensis* (Goeldi), Species "A" (a new species related to *C. niger* Root and Hoffman), and Species "C" (a new species related to *C. fluvialis* Macfie). Identifications were made by Dr. Willis Wirth of the U. S. National Museum, and the new species will be described by him.

Several hundred specimens of *C. paraensis* and Species "C" were dissected after feeding on a subject heavily infected with microfilariae of *Onchocerca volvulus,* who has repeatedly been used to infect *Simulium* for experimental studies. None of these flies had ingested microfilariae. A large series of Species "A" was dissected at various intervals of time after feeding on the same subject; about 24 per cent had ingested microfilariae. In one of these flies a living microfilariae was found six days after the infective meal. Although this larva had grown considerably in length it showed very little differentiation, whereas six-day larvae in *Simulium* have the various organ systems well developed. Thus it appears that Species "A" can ingest microfilariae but will not support development of the ingested larvae, whereas *C. paraensis* and Species "C" are not capable of ingesting microfilariae.

In order to determine the natural infection rate of Species "A," about two hundred flies were collected from a person known to be free of infection with *Onchocerca volvulus.* Dissections of these flies failed to reveal any infections.

80. Entamoeba terrapinae *Infections in Snakes.* M. J. Miller, The Institute of Parasitology, McGill University, Macdonald College, P.Q.

E. terrapinae has been found to be a common parasite of the large bowel of the turtle, *Pseudemys elegans.* As pointed out by Sanders and Cleveland (1930) it is morphologically very similar to *E. histolytica* and also closely resembles *E. invadens.* It grows readily in culture at room temperature, producing cysts which are usually small (9 to 11 μ). Trophozoites and cysts of *E. terrapinae* growing in cultures were inoculated orally into three garter snakes (*Thamnophis sirtalis*). Infection was induced in two of the three snakes which passed cysts and trophozoites in their feces within four days of inoculation. In one snake the infection has persisted for over a month with no evidence of tissue invasion. Three garter snakes, similarly inoculated with *E. invadens,* died of amoebiasis within two weeks. There is no record of an infection with *E. invadens* in snakes which did not end fatally. On the basis of these limited experiments it appears that there are two species of amoebae infective to snakes, morphologically very similar to each other and to *E. histolytica,* but differing physiologically in that one always invades the host tissue to cause lesions and eventual death, whereas the other apparently lives as a commensal.

81. *The Transmission of Non-cyst-forming Intestinal Flagellates in the Yucca Night Lizard* Xantusia vigilis. Y. U. Amrein, University of California at Los Angeles.

During an intensive study of the intestinal entozoa of the California Night Lizards, experiments were carried out to determine the mode of transmission of non-cyst-forming intestinal flagellates in *Xantusia vigilis,* a desert-inhabiting species. Flagellate-free lizards were obtained by prolonged exposure to pure oxygen under pressure and by surgical aseptic delivery of young *X. vigilis.* Such lizards were maintained in isolated cages in contact only with *Tenebrio molitor* for food. The mealworms were shown not to carry any of the entozoa found in *X. vigilis.* During the experiments, properly marked flagellate-free *X. vigilis* were placed into large cages with sterilized sand, together with sixty to seventy freshly collected and naturally infected Yucca Night Lizards, and maintained in this environment. Examination of experimental lizards at the end of two months revealed that in the absence of any insects—except *Tenebrio molitor*—the originally flagellate-free *X. vigilis* had picked up infection with the non-cyst-forming flagellates known to occur in this lizard. Not all the experimental *X. vigilis* were infected with all three of the different species of flagellates in question, but it was shown that *Monocercomonoides lacertae, Monocercomonas colubrorum,* and *Tritrichomonas augusta* could be transmitted in *X. vigilis* by contamination. Direct transmission, and the observed fact that infections are being picked up during birth of this ovoviviparous lizard, appear to account for the spread of non-cyst-forming flagellates in *X. vigilis.* No invertebrate vectors seem to be required for such transmission, and in fact could not be demonstrated.

Direct transmission by contamination was shown also to pertain to all the other protozoan and helminth entozoa encountered in the intestine of *X. vigilis* with the single exception that the anoplocephaline cestode *Oochoristica scelopori* apparently requires an invertebrate intermediate host.

82. *Chagas' Disease in the United States.* Emmanuel Dias, Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.

Seventeen species and subspecies of triatomid bugs have been reported in the United States. Natural infection with *Schizotrypanum cruzi* has been reported in the following species and subspecies: *Triatoma gerstaeckeri, Triatoma lectularius, Triatoma longipes, Triatoma neotomae, Triatoma protracta, Triatoma protracta woodi, Triatoma rubida uhleri, Triatoma sanguisuga,* and *Triatoma sanguisuga ambigua.* Infected cone-nosed bugs have been found in the states of California, Arizona, New Mexico and Texas. Twenty per cent of 3,824 cone-nosed bugs examined proved to be infected with flagellates. *Schizotrypanum cruzi* is so far the only flagellate encountered in triatomid bugs in the U.S.A. Strains of *S. cruzi* which proved to be pathogenic to susceptible animals as well as to man have been isolated from these bugs.

The following animals were found to harbor *S. cruzi* in the U.S.A.; *Neotoma fuscipes macrotis, Neotoma albigula albigula, Neotoma micropus micropus, Peromyscus boylii rowlei, Mus musculus, Didelphis virginiana,* and *Dasypus novemcinctus texanus.*

Trypanosomes have been found in the blood of several bats; *Antrozous pallidus pacificus, Myotis velifer velifer, Myotis occultus,* and *Pipistrelius hesperus maximus.* Although no strictly domesticated species of cone-nosed bugs exist in the United States, the contact of the existing species with man is comparatively frequent. Although human schizotrypanosis probably does occur in the U.S.A., no definite case of the infection has been reported so far. However, in a few individuals from Texas the complement-fixation test for Chagas' disease has been positive, some of them exhibiting electrocardiographic changes suggestive of chronic Chagas' heart disease. Besides the usual preventive and control measures against the triatomas, the spraying of *Neotoma* nests and other breeding places with gammexane should be recommended, especially when they are located in the vicinity of houses.

83. *Action of Cortisone Alone or Associated to Pentaquine Phosphate or to the Compound Pentaquine Phosphate—Quinine Sulphate on Experimental Trypanosomosis* (T. cruzi) *in Mice.* Moises Agosín, René Christen and Arturo Jarpa, Department of Parasitology, University of Chile, Santiago, Chile.

The capacity of Cortisone for altering the course of certain bacterial and virus infections is already well known. Therefore, it has become necessary to study the action of this hormone upon protozoan diseases.

The authors have analyzed, in a series of experiments, the action of Cortisone acetate either alone or associated to Pentaquine Phosphate or to the compound Pentaquine Phosphate-Quinine Sulphate, in genetically pure mice of the Dba strain experimentally inoculated with *Trypanosoma cruzi* (Tulahuén strain). The results obtained show that the hormone exerts a clearly unfavorable action upon the course of infections with *T. cruzi,* as revealed by high parasitaemia, a clear fall of the weight curve and an increase of the mortality rate. This negative action has an antagonic effect upon the trypanocide properties of the quinolines used; in fact, although they were given in doses which are effective under normal conditions, they could not counteract the action of Cortisone.

Cortisone acetate seems to act—either directly or indirectly—by modifying the immunitary response of the animals. It is a well-known fact that this hormone causes a decrease of the rate of circulating antibodies and that it modifies the reactions against certain antigens in laboratory animals; nevertheless, a direct stimulating action upon *T. cruzi* cannot be discarded.

84. *"Operation Santobrite"—A Schistosome Snail Eradication Program in Japan.* G. W. Hunter III, L. S. Ritchie, R. E. Freytag, C. Pan, D. E. Potts, 406th Medical General Laboratory, Tokyo, Japan and M. Yokogawa, National Institute of Health and Institute of Public Health and Welfare, Tokyo, Japan.

In 1947, the laboratory undertook a cooperative program with the Japanese National Institute of Health to screen a number of potential molluscacides. Small field plot tests gave good results with sodium pentachlorophenate (Santobrite), 40% dinitro-o-cyclohexylphenol (DN-I) and 20% dicylclohexylamine salt of DN-I (DN-III).

A village on Kyushu, Nagatoishi-cho, encompassing 150 acres enclosed by dykes, with a population of 1050 persons, was selected for a large field experiment using Santobrite as the molluscaide. The chemical was to be applied in the spring and fall of 1950 and 1951 along the irrigation ditches and the edges of the fields or paddies; 390 grams of Santobrite dissolved in 20 gallons of water (approximately 1:200 dilution) was used for every 150–200 feet of ditch. A total of 190 permanent snail collecting stations were arbitrarily, but systematically, selected, at which pre- and post-treatment quadrants were examined in conjunction with each treatment. Non-treated control areas were also collected.

Results were calculated using the initial pre-treatment snail count as a base line for com-

parison. The initial post-treatment count showed a population reduction of 98.14%. Fall pre-treatment counts indicated some increase in the snail population during the summer and the fall post-treatment counts fell to a 90.2% overall reduction when compared with those of the spring. Similar studies following the spring treatment in 1951 showed that control efforts had reduced the snails 99.5%. It is felt that this chemical holds promise of being a practical molluscacide for the control of *Oncomelania nosophors* in Japan.

85. *Some Effects of Cultural Associates on the Infectivity of a Strain of* Endamoeba histolytica. George W. Luttermoser and Bruce P. Phillips, National Institutes of Health, National Microbiological Institute, Bethesda 14, Maryland.

The 200 strain of *Endamoeba histolytica* has exhibited a high rate of infectivity for rabbits, guinea pigs and dogs when cultivated with an associated bacterial flora. To ascertain the effects, if any, of the associated organisms on the infectivity of the amoebae, trophozoites were freed from bacteria and cultivated with *Trypanosoma cruzi* (A-T cultures) by the method of Phillips. Active amoebae from these A-T cultures were then inoculated intracecally into rabbits.

Of a total of 25 rabbits, each of which received 100,000 or more amoebae, only one developed an ulcer containing *E. histolytica.* Furthermore, examination of scrapings of the cecal wall and smears of the contents of the lumen were negative for amoebae. On the other hand, 11 of 15 control rabbits, which received an inoculum of the same strain of amoebae cultivated with a mixed bacterial flora, became infected.

Attempts to increase the infectivity of the A-T culture amoebae by adding defibrinated rabbit blood or heat-treated bacteria to the medium, or by the simultaneous inoculation of mixed bacterial flora, have been without favorable results. However, fatal infections developed in most of 17 animals inoculated with the amoebae after their re-establishment with a mixed bacterial flora. This re-establishment with bacterial flora *in vitro* required a period of from 2 to 3 weeks.

86. *Comparative Susceptibility of Common Laboratory Animals to Experimental Infection with* Schistosoma haematobium. Donald V. Moore and Henry E. Meleney, New York University, College of Medicine.

Albino mice, golden hamsters, albino rats, guinea pigs, and rabbits were exposed, percutaneously, to cercariae of *Schistosoma haematobium.* Criteria used to evaluate the suitability of the animals as hosts for *S. haematobium* were, percentage worm recovery, gross pathology and passage of viable eggs in the feces.

Mice exposed to 150 cercariae each, yielded 3% worm recovery. Eggs were first found in the tissues 10 weeks after exposure. Intestinal egg-lesions were limited to the jejunum and colon, but the lesions were not numerous. Eggs were first found in the feces 15 weeks after infection and egg passage continued for one year.

Hamsters exposed to 200 cercariae each, yielded 20% worm recovery. Eggs were first observed in the tissues 10 weeks after exposure. Intestinal egg-lesions were limited to the jejunum and colon with the greatest concentrations of eggs found in the ascending and transverse colon. Bladder lesions appeared in old infections. Eggs were first observed in the feces 10 weeks after infection and egg passage continued for over a year.

Albino rats and guinea pigs, exposed to 500 cercariae each, yielded 0.1% worm recovery. No gross pathology or egg passage was observed. Rabbits exposed to 1000–11,000 cercariae each yielded no worms.

Of the animals studied, the golden hamster proved to be the most satisfactory experimental host for *S. haematobium.* Rabbits seemed to be completely refractory to infection.

AMERICAN SOCIETY OF PARASITOLOGISTS

Fortieth Council Meeting, Cleveland, Ohio
December 27, 1950

The meeting of the Council of the American Society of Parasitologists was called to order by President Willard H. Wright at 8:35 PM, December 27, 1950, in Parlor G, Hotel Hollenden, Cleveland. Past-Presidents Asa C. Chandler, William W. Cort, George R. LaRue, James E. Ackert, Horace W. Stunkard, and the following members of the Council were present: Willard H. Wright, Harold W. Manter, Robert M. Stabler, Emmett W. Price, Martin D. Young, Paul D. Harwood, George L. Graham, Lloyd A. Spindler, John C. Swartzwelder and Harold W. Brown. Gilbert F. Otto attended.

The regular order of business was taken up.

I. Reports of Officers

1. *Secretary (H. W. Brown):* As of December 15, 1950, there were 779 members of the Society, of whom 688 lived within and 91 outside continental United States. Of these, 49 persons were delinquent for dues for 1950, leaving a net membership in good standing of 651 domestic and 79 foreign, or a total of 730 active members. These figures indicate a continuing growth in Society membership. Sixty-seven persons were elected to membership during the calendar year 1950 to December 15, of whom 64 lived within and 3 outside continental United States. The names of 7 additional persons will be presented to the Council for election to the Society later in the meeting.

Dr. Banner Bill Morgan of the Department of Veterinary Science of the University of Wisconsin and a member of the Society passed away on September 8, 1950.

The report was amended to include the notice of the death of Dr. Charles F. Craig, on December 9, 1950, and of Dr. A. B. Hardcastle, on December 14, 1950, both members of the Society.

The report was accepted as amended and placed on file.

2. *Treasurer (R. M. Stabler):* The Treasurer's complete report was presented to the members of the Council. A summary of the report for the twelve-month period, December 1, 1949, to December 1, 1950, follows:

a. The balance on hand as of 1 Dec. 49 was $2,798.60.
b. The collections from all sources to 1 Dec. 50 amounted to $13,146.43.
c. Total funds for the year, therefore, were $15,945.03.
d. Total expenditures were $8,960.22.
e. Total cash balance as of 1 Dec. 50 is, therefore, $6,984.81.

The report was audited and found correct by L. A. Spindler and J. C. Swartzwelder, and was accepted by the Council.

II. Reports of Custodians and Committees

1. *Custodian of the Endowment Fund (N. R. Stoll):* The complete report of the Custodian of The Endowment Fund for the second year, ending December 14, 1950, was presented to the members of the Council. The Endowment Fund now amounts to $1,099.42. Due to the low bank interest rates the Custodian, with the approval of his two co-trustees, invested $740 in a $1,000 U. S. Savings Bond, Series F, in January, 1950. The balance of $355.71, on February 8, 1950, was transferred to the Princeton Savings and Loan Association at a rate of 2½ per cent per annum.

The report was audited and found correct by L. A. Spindler and J. C. Swartzwelder, and was accepted by the Council.

2. *Chairman of the Editorial Committee (Horace W. Stunkard):* The Chairman, H. W. Stunkard, reported that six issues and Supplement of The Journal of Parasitology were printed in 1950. He reported that papers submitted for publication in the Journal reached the printed page in about seven months. He reported that printing costs continue to rise. The chairman announced with regret that William A. Riley, who has given continual service as a member of the Editorial Committee since its beginning, has found it necessary to resign.

The report was accepted and placed on file.

3. *Custodian of Back Issues (G. F. Otto):* The Custodian reported that the sale of back issues, portraits, and quindices continued at a high level. Arrangements have been made with The Chemical Foundation to borrow $2,500 without interest for duplication of back issues. This sum will permit the duplication of back issues. This sum will permit the duplication of all issues exhausted or down to one copy back to Volume 1, No. 1.

The financial report of the Custodian of Back Issues was examined by L. A. Spindler and J. C. Swartzwelder and found to be correct.

4. *Committee on Visual Instruction (M. S. Ferguson and W. M. Reid):* No Report.

5. *Committee on Avian Malaria (C. G. Huff) and Committee on Common Names (P. D. Harwood):* No report.

III. Reports of Representatives

1. *To Council of A.A.A.S. (K. C. Kates and A. O. Foster):* No report.

2. *To Governing Board of the American Institute of Biological Sciences (W. W. Cort):* Dr. Cort called attention to the A.I.B.S. booklet that was recently published, which outlines the activities of the organization.

3. *To Division of Biology and Agriculture of the National Research Council (N. R. Stoll):* The Society's Representative, N. R. Stoll, reported on the annual meeting of the Division in Washington in May, 1950, and on the numerous activities of this organization. Dr. C. J. Hylander was employed as full-time Executive Secretary of A.I.B.S. This organization is continuing to sponsor the development of the Handbook of Biological Data.

The report was accepted and placed on file.

IV. Old Business

1. It was proposed by N. R. Stoll that the By-Law regulating the Endowment Fund be amended to substitute the word "trustees" for "custodians" in the two places indicated: "Council shall select a Custodian of the Endowment Fund and two associates, to whom it may delegate responsibility for the management of the Fund. The Custodian shall make an annual accounting to Council and such other reports as Council may request. The approval of two of the three *custodians* shall be necessary for the purchase, sale or exchange of securities. One of these *custodians* shall be the Treasurer of the Society and his signature shall be required on all vouchers of expenditure from the Fund."

A motion to amend the By-Law was made and carried.

V. New Business

1. *Election of New Members:* Seven applicants were elected by the Council to active membership in the Society: Charles P. Brooks, 444½ Pine Street, New Orleans, Louisiana; Patricia Bynum, Biology Department, Fort Hays Kansas State College, Hays, Kansas; Kam-Fai Chan, 550 Riverside Drive, Apartment 24, New York 27, New York; J. H. Drudge, Veterinary Science Department, P. O. Box 238, State College, Mississippi; Malcolm A. Franklin, Box 375, Oxford, Mississippi; Harry Herlich, Reg. Lab., Bureau of Animal Industry, P. O. Drawer 952, Auburn, Alabama; Teresa I. Mercado, 3722—12th Street, N.E., Washington 17, D. C.

2. *Place of Meeting in 1951:* It was voted that the Society meet with the National Malaria Society, The American Academy of Tropical Medicine and The American Society of Tropical Medicine in Chicago, November 15th, 16th and 17th.

3. *Establishment of a Specialty Board in Medical Microbiology:* The proposed certification of medical microbiologists was discussed and it was voted that the Secretary, H. W. Brown, and Henry E. Meleney constitute a committee to secure further data on this matter and to represent the Society in this movement.

4. *Proposed Federation of Microbiological Societies:* The proposed Federation of Microbiological Societies was discussed and the Council voted that the mail vote taken on this matter should stand. This vote indicated that 6 of the Council members were opposed to joining such a federation, 3 were in favor of joining, 2 were conditionally in favor, 1 had no opinion, and 1 wished to reserve opinion until Council meeting.

5. *"Experimental Parasitology":* The new bimonthly journal, "Experimental Parasitology" was discussed and it was the sentiment of the Council that the Society should continue to do everything to strengthen its own journal.

6. *Nominations, Elections and Appointments to Society Offices:*

   a. *Nominations:* The following persons were nominated by the Council for the designated offices in the Society for 1951: President, Benjamin Schwartz; Vice-President, Eloise B. Cram; Treasurer, R. M. Stabler (term runs through 1952); Council Members at Large, Donald B. McMullen and A. C. Walton (term runs through 1954).

   b. *New Editorial Committee members appointed:* Cornelius B. Philip appointed to fill the vacancy created by the resignation of William A. Riley.

   c. *New Editorial Board members appointed:* Raymond M. Cable, Lloyd A. Spindler and Martin D. Young. John T. Lucker's letter of resignation from the Editorial Board was read, and it was voted, in view of his outstanding contributions, not to accept his resignation, the Editor of the Journal stating he would call on Dr. Lucker only occasionally.

   d. *Re-appointed Representative to Division of Biology and Agriculture of the National Research Council:* N. R. Stoll.

The Council voted to adjourn at 11:25 PM.

Respectfully submitted,
H. W. Brown, Secretary

AMERICAN SOCIETY OF PARASITOLOGISTS
TWENTY-FIFTH ANNUAL GENERAL BUSINESS MEETING
DECEMBER 28, 1950

The general business meeting of the Society was called to order by Willard H. Wright, the Society's President, at 2 PM following the annual luncheon in the Hotel Hollenden, Cleveland. One hundred and fifty-three persons were present.

1. Reports of Officers, Custodians and Committees, and Society Representatives were read and approved.

2. The names of the seven new members elected at the Fortieth Council Meeting were announced.

3. The officers and Council members of the American Society of Parasitologists nominated at the Fortieth Council Meeting were elected to their respective offices.

4. It was announced that the American Society of Parasitology would meet with the National Malaria Society, The American Academy of Tropical Medicine and The American Society of Tropical Medicine in Chicago, November 15th, 16th and 17th, 1951.

The Society voted to adjourn the meeting at 2:30 PM.

Respectfully submitted,
H. W. Brown, Secretary

AMERICAN SOCIETY OF PARASITOLOGISTS

Officers for 1951

BENJAMIN SCHWARTZ, U. S. Bureau of Animal Industry ..... *President*
ELOISE B. CRAM, National Institutes of Health ..... *Vice-President*
HAROLD W. BROWN, Columbia University ..... *Secretary*
ROBERT M. STABLER, Colorado College ..... *Treasurer*

Council Member Ex Officio[1]

HORACE W. STUNKARD, New York University ..... *Chairman, Editorial Committee*

Council Members at Large
(with date of expiration of term)

1954 DONALD B. MCMULLEN, University of Oklahoma
1954 ARTHUR C. WALTON, Knox College
1953 GEORGE W. WHARTON, Duke University
1953 JOHN C. SWARTZWELDER, Louisian State University
1952 G. L. GRAHAM, University of Pennsylvania
1952 L. A. SPINDLER, U. S. Bureau of Animal Industry
1951 PAUL D. HARWOOD, Dr. Hess & Clark, Inc.
1951 CLAY G. HUFF, Naval Medical Research Institute

Representatives of the Society on the Council of the American Association for the Advancement of Science
(2-year terms expire 1951)

AUREL O. FOSTER KENNETH C. KATES

Representative of the Society on the Governing Board of the American Institute of Biological Sciences
(4-year term expires June 30, 1952)
W. W. CORT

Representative of the Society to Division of Biology and Agriculture of the National Research Council
(2-year term expires 1952)
NORMAN R. STOLL

Editorial Committee of the Journal of Parasitology

HORACE W. STUNKARD, *Chairman* ..... to serve until 1953
JUSTIN M. ANDREWS ..... to serve until 1953
CORNELIUS B. PHILIP ..... to serve until 1953

Editorial Board of the Journal of Parasitology

1954 RAYMOND M. CABLE, Purdue University
1954 L. A. SPINDLER, U. S. Bureau of Animal Industry
1954 MARTIN D. YOUNG, U. S. Public Health Service
1953 W. W. CORT, Johns Hopkins University
1953 WILLIAM A. RILEY, University of Minnesota
1953 HAROLD KIRBY, University of California
1952 E. E. BYRD, University of Georgia
1952 G. ROBERT COATNEY, National Institutes of Health
1952 WILLIAM L. JELLISON, U. S. Public Health Service
1951 ELERY R. BECKER, Iowa State College
1951 NORMAN R. STOLL, Rockefeller Institute for Medical Research
1951 GEOGRE W. WHARTON, Duke University

Custodian of Back Issues
(3-year term expires 1951)
GILBERT F. OTTO

List of Former Officers

	President	*Vice-President*
1925	HENRY B. WARD*	SAMUEL T. DARLING*

[1] Beginning in 1942, the Chairman, Editorial Committee, became ex officio member of Council.
* Deceased.

1926	Charles W. Stiles*	Charles A. Kofoid*
1927	Richard P. Strong*	Edwin Linton*
1928	Charles A. Kofoid*	Robert Hegner*
1929	Nathan A. Cobb*	George R. LaRue
1930	William W. Cort	Ernest Carroll Faust
1931	William A. Riley	Asa C. Chandler
1932	Maurice C. Hall*	William H. Taliaferro
1933	William H. Taliaferro	Fred C. Bishopp
1934	Ernest E. Tyzzer	James E. Ackert
1935	Charles F. Craig*	Harley J. Van Cleave
1936	Robert Hegner*	William B. Herms*
1937	George R. LaRue	David H. Wenrich
1938	Fred C. Bishopp	Elery R. Becker
1939	Horace W. Stunkard	Henry E. Meleney
1940	David H. Wenrich	Gotthold Steiner
1941	James E. Ackert	Justin Andrews
1942	Henry E. Meleney	Rudolf W. Glaser*
1943	Henry E. Meleney	Rudolf W. Glaser*
1944	Henry E. Ewing	Benjamin Schwartz
1945	Asa C. Chandler	Donald L. Augustine
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1947	Harley J. Van Cleave	Clay G. Huff
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1949	Thomas W. M. Cameron	Willard H. Wright
1950	Willard H. Wright	H. W. Manter

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William W. Cort	1925; 1926; 1927; 1928; 1929
Norman R. Stoll	1930; 1931; 1932

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Horace W. Stunkard	1933–34; 1935–36; 1937
Oliver R. McCoy	1938–39; 1940–41; 1942
James T. Culbertson	1942–43; 1944–45; 1946–47
Harold W. Brown	1948–49; 1950–51

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William A. Riley	1925–26; 1928–30	Norman R. Stoll	1933–36; 1937–47; 48
Charles W. Stiles*	1925; 1929–32	Eloise B. Cram	1934–37
Ernest E. Tyzzer	1925–26	Wilbur A. Sawyer	1934–37
Maurice C. Hall*	1926–29	James E. Ackert	1935–38
Wilson G. Smillie	1926–27	Earl C. O'Roke	1936–39
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J. H. St. John*	1927–28	Elery R. Becker	1939–43
W. H. Taliaferro	1928–31	Emmett W. Price	1939–43; 1944–46; 1947–50
Asa C. Chandler	1929–30; 1936–39	Clay G. Huff	1940–43; 1944–46; 1948–51
W. B. Herms*	1930–33	Horace W. Stunkard	1940–43
Benjamin Schwartz	1930–33	Donald L. Augustine	1941–44
L. R. Cleveland	1931	Raymond M. Cable	1942–45
W. W. Cort	1931–34; 1935–38	Gilbert F. Otto	1942–44; 1945–48

* Deceased.

Willard H. Wright	1942–45; 1946–48
Harold W. Brown	1944–47
Harold W. Manter	1944–46
G. Robert Coatney	1945–48
T. W. M. Cameron	1946–48
Martin D. Young	1947–50
Cornelius B. Philip	1947
Paul D. Harwood	1948–51
John C. Swartzwelder	1949; 1950–
James T. Culbertson	1949
G. L. Graham	1949–
L. A. Spindler	1949–
George W. Wharton	1950–
Donald B. McMullen	1951–
A. C. Walton	1951–

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William A. Riley	1934–37; 1938–42; 1943; 1944–48; 1949–50
William H. Taliaferro	1934–37; 1938–42; 1943
David H. Wenrich	1944–48
Justin M. Andrews	1949–
Cornelius B. Philip	1950–

Editorial Board of the Journal of Parasitology

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Maurice C. Hall*	1932–33
Henry B. Ward*	1932–33
Asa C. Chandler	1932–34; 1935–38; 1939–42
Charles A. Kofoid*	1932–34; 1935–38
William A. Riley	1932–34; 1951–
W. H. Taliaferro	1932–34
James E. Ackert	1932–35
Richard P. Strong*	1932–35; 1936–39
Fred C. Bishopp	1932–36
George P. LaRue	1932–36
David H. Wenrich	1932–36; 1938–41
Ernest C. Faust	1933–37
Benjamin Schwartz	1933–37; 1938–41; 1942–45
Elery R. Becker	1934–35; 1936–39; 1948
Robert Matheson	1935–38
Oliver R. McCoy	1936–39
Henry E. Ewing	1937–40
John F. Kessel	1937–40
Harley J. Van Cleave	1937–40
William W. Cort	1938–41; 1942–45; 1946–49; 1950–
Cornelius B. Philip	1939–42; 1950–
Ernest E. Tyzzer	1939–42
Harold W. Brown	1940–43
Harold W. Manter	1940–43
Reginald D. Manwell	1940–43
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Justus F. Muller	1941–44
Harold Kirby	1942–45; 1951–
Benjamin G. Chitwood	1943–46
Pincus P. Levine	1943–46
Rudolf Glaser*	1943–46
Lowell T. Coggeshall	1944–47
John T. Lucker	1944–47; 1950
Norman R. Stoll	1944–47; 1948
William L. Jellison	1945–48; 1949–
Charles W. Rees	1945–48
Lloyd A. Spindler	1945–48; 1951–
Raymond M. Cable	1946–49; 1951
Lloyd E. Rozeboom	1946–49
Richard J. Porter	1947–50
William Trager	1947–50
Arthur C. Walton	1947–50
George W. Wharton	1948
E. E. Byrd	1949
G. Robert Coatney	1949–

List of Meeting Places

1925	Kansas City	1934	Pittsburgh	1943	(No meeting)
1926	Philadelphia	1935	St. Louis	1944	Cleveland
1927	Nashville	1936	Atlantic City	1945	St. Louis
1928	New York	1937	Indianapolis	1946	Boston
1929	Des Moines	1938	Richmond	1947	Chicago
1930	Cleveland	1939	Columbus	1948	New Orleans
1931	New Orleans	1940	Philadelphia	1949	New York
1932	Atlantic City	1941	Dallas	1950	Cleveland
1933	Boston	1942	(New York, cancelled)		

* Deceased.

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† Kofoid, Charles A.
† Stiles, Charles W.
† Ward, Henry B.
† Smith, Theobald

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Bacigalupo, Juan	1941	Sergent, Edmond	1932
Baylis, Harry A.	1932	Sergent, Etienne	1932
† Brumpt, Émile	1930	Shortt, Henry E.	1948
† Fuhrmann, Otto	1930	Skrjabin, Konstantin I.	1932
† Fujinami, Akira	1930	Swellengrebel, N. H.	1939
† Fülleborn, Friedrich, G. H.	1930	† Theiler, Arnold	1930
Martini, Eric	1932	Travassos, Lauro Pereira	1938
† Nuttall, George H. F.	1930	† Wenyon, Charles Morley	1938
† Perroncito, Edoardo	1930		

ACTIVE MEMBERS

As of March, 1951[1]

1949 Abdel-Malek, Emile T., Museum of Zoology, University of Michigan, Ann Arbor, Michigan.
*Ackert, James E., Dept. of Zoology, Kansas State College, Manhattan, Kansas.
1939 Acosta-Matienzo, Josefina, School of Tropical Medicine, San Juan, Puerto Rico.
1934 Adams, James Alfred, N. Y. State Agric. Exper. Station, Cottage Road, Poughkeepsie, New York.
1948 Adams, James R., Dept. of Zoology, University of British Columbia, Vancouver, B. C., Canada.
1929 Alicata, Joseph E., University of Hawaii, P. O. Box 18, Honolulu, T. H.
1942 Allen, Rex W., P. O. Box 128, State College, New Mexico.
1941 Allen, Robert M., Dept. of Bacteriology, School of Medicine, Rochester 7, New York.
1934 Allison, Leonard Newton, State Fish Hatchery, Grayling, Michigan.
1949 Alvarez, Daniel A., Jr., Cornell University Medical College, 1300 York Ave., New York 21, New York.
1948 Alvarez, Julio, Vernaza Hospital, Guayaquil, Ecuador, S. A.
1945 Alves Meira, Joao, Rua Atlantica 481, Sao Paulo, Brazil.
1927 Ameel, Donald J., Dept. of Zoology, Kansas State College, Manhattan, Kansas.
1950 Amrein, Yost U., 346 Harvard Ave., Claremont, California.
1940 Anderson, Cyrus V., J. R. Watkins Co., Winona, Minnesota.
1944 Anderson, Dorcas Jane, Dept. of Biology, Kent State University, Kent, Ohio.
1930 Anderson, M. G., New Mexico State College of Agriculture & Mechanical Arts, State College, New Mexico.
1930 Andrews, John S., Coastal Plain Experiment Station, Tifton, Georgia.
*Andrews, Justin M., U. S. Public Health Service, Communicable Disease Center, 50 Seventh Street, N.E., Atlanta 5, Georgia.
1931 Annereaux, Ralph F., Animal Pathology Laboratory, Dept. of Agriculture, Sacramento 14, California.
1948 Anthony, James D., Dept. of Zoology, University of Michigan, Ann Arbor, Michigan.
1947 Appleton, Syril, 575 West End Avenue, New York 24, New York.
1951 Arakawa, Ken, School of Tropical and Preventive Medicine, Loma Linda, California.
1939 Arant, Frank S., Zoology and Entomology Department, Alabama Polytechnic Institute, Auburn, Alabama.
1948 Armer, Sister Joseph Marie, Incarnate Word College, San Antonio 2, Texas.
1934 Arnold, John G., Jr., Dept. of Biology, Loyola University, New Orleans 15, Louisiana.
1932 Atchley, Floyd O., P. O. Box 477, Manning, South Carolina.
1949 Auerbach, Earl, Dept. of Biology, Swift Hall, Northwestern University, Evanston, Illinois.

† Deceased.

[1] Names of 321 charter members were published in The Journal of Parasitology, Vol. 12, pp. 170–176, (1926). The last complete list of members was published in The Supplement of the December issue, Vol. 33, (1947).

* Charter Members.

*Augustine, Donald L., Dept. of Tropical Public Health, Harvard School of Public Health, Boston 15, Massachusetts.
1941 Augustson, G. F., 315 South J. Street, Madera, California.
1948 Axman, Sister M. Claudine, Sacred Heart College, 3100 McCormick Ave., Wichita 12, Kansas.

1950 Babero, Bert B., U. S. Public Health Service, P. O. Box 960, Anchorage, Alaska.
1926 Bachman, George W., Brookings Institute, 722 Jackson Place, N.W., Washington 6, D. C.
1947 Bahler, Thomas Lee, Dept. of Phys. & Zool., Utah State Agric. College, Logan, Utah.
1947 Bailey, Wilford Sherrill, School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn, Alabama.
1932 Baker, Donald W., Parasitological Laboratory, N. Y. State Veterinary College, Cornell University, Ithaca, New York.
1946 Baker, Edward William, U. S. Bureau of Entomology, U. S. National Museum, Washington, D. C.
1945 Balamuth, William, Dept. of Biological Sciences, Northwestern University, Evanston, Illinois.
*Ball, Gordon, H., 405 Hilgard Avenue, University of California at Los Angeles, Los Angeles, California.
1949 Ball, William, 393 E. Cliveden Street, Philadelphia 19, Pennsylvania.
1949 Ballantyne, Donald L., Jr., 20 E. 74th Street, New York, New York.
*Bangham, Ralph Vandervort, Biology Department, College of Wooster, Wooster, Ohio.
1950 Banks, William M., 917 River Road Dormitories, Columbus, Ohio.
1948 Barnett, Herbert C., Hdq. Medical Field Service School, Ft. Sam Houston, Texas.
1946 Baroody, Bahij J., Timmonsville, South Carolina.
1940 Barrett, John P., Chemical Research & Development Dept., Armour & Co. Laboratories, 1425 W. 42nd St., Chicago 9, Ill.
1951 Bartha, Alex S., Juniata College, Huntingdon, Pennsylvania.
*Bartsch, Paul, U. S. National Museum, Washington, D. C.
1949 Basir, Khan M. A., Dept. of Zoology, Muslim University, Aligarh (U.P.), India.
1940 Basnuevo y Artiles, Jose G., Apartado Correos 670, Havana, Cuba.
1949 Batten, Peter, J., Jr., 604 E. Armory Ave., Champaign, Illinois.
1949 Baughn, Charles, Jr., Box 1247, Chapel Hill, North Carolina.
*Beaudette, Frederick R., Agricultural Experiment Station, New Brunswick, New Jersey.
1929 Beaver, Paul C., Dept. of Tropical Medicine, Tulane University School of Med., New Orleans, Louisiana.
1949 Beck, D. Elden, Zoology Dept., Brigham Young University, Provo, Utah.
1949 Beck, J. Walter, Dept. Bact. and Parasitology, Univ. of Arkansas School of Med., Little Rock, Arkansas.
*Becker, Elery R., 413 Lynn Ave., Ames, Iowa.
1949 Becklund, Willard W., Animal Industry, Zoological Branch, Box 464, Albuquerque, New Mexico.
1942 Belkin, John N., Div. of Entomology, College of Agriculture, Univ. of California, Los Angeles 24, California.
1948 Bell, Frances, 1216 Eighth Avenue, Tuscaloosa, Alabama.
1946 Bell, Samuel D., Jr., 2 Linden Street, Brattleboro, Vermont.
1940 Beltran, Enrique, Dept. of Protozoology, Institute of Public Health and Tropical Diseases, Mexico, D. F., Mexico.
*Benbrook, Edward A., Division of Veterinary Pathology, Iowa State College, Ames, Iowa.
1943 Ben-Harel, Shulamite, Box 222, Princeton, New Jersey.
1933 Bennett, Harry J., Dept. of Zoology, Louisiana State University, Baton Rouge, Louisiana.
1942 Bennington, Elwin E., Box 149, Route #2, Corvallis, Oregon.
1939 Berberian, D. A., 439 Loudonville Rd., Loudonville, New York.
1950 Bergman, George J., Dept. of Biology, State Teachers College, East Stroudsburg, Pennsylvania.
1948 Berry, Roland E., 91 Gainsborough St., Boston 15, Massachusetts.
1948 Beye, Henry K., Box 589, Papeete, Tahiti.
*Bishopp, F. C., U. S. Bureau of Entomology, Washington, D. C.
1943 Bissinger, Lester L., Station Hospital, Smyrna A.F.B., Tennessee.
1927 Black, James J., Poultry Laboratory, Landis & Brewster, Vineland, New Jersey.
1944 Blackburn, Clyde Carlton, (address unknown).

* Charter Members.

1950 Bliznick, Alexander, 115–33 196th St., St. Albans, New York.
1949 Booth, Ernest S., Dept. of Biology, Walla Walla College, College Place, Washington.
1931 Boardman, Edward T., Rochester Museum of Arts & Sciences, 657 East Avenue, Rochester 7, New York.
1944 Bonilla-Naar, Alfonso, Carrera 4A, 14–61, Bogota, Colombia.
1949 Bouchard, J. Louis, Dept. of Zoological Sciences, University of Oklahoma, Norman, Oklahoma.
1927 Boughton, Donald C., DuPont Vetchem Lab., South Hall, University of Delaware, Newark, Delaware.
1950 Bourns, T. K. R., Box 210, Kamloops, British Columbia, Canada.
1946 Boyd, Elizabeth M., Zoology Department, Mt. Holyoke College, South Hadley, Massachusetts.
1928 Boyd, George H., Dean, Graduate School, University of Georgia, Athens, Georgia.
1938 Brackett, Sterling, American Cyanamid Company, Lederle Laboratories Division, 30 Rockefeller Plaza, New York 20, New York.
1927 Bradbury, Ora C., Department of Biology, Wake Forest College, Wake Forest, North Carolina.
1946 Bradin, John L., Jr., 1430 Tulane Ave., New Orleans, 13, Louisiana.
1928 Branch, Hazel E., Dept. Zoology, University of Wichita, Wichita, Kansas.
1949 Brandt, Milo C., Biological Research Division, The Lilly Research Laboratories, Indianapolis 6, Indiana.
1943 Bravo Hollis, Margarita, Instituto de Biologia, Casa del Lago, Chapultepec, Mexico, D. F.
1946 Brennan, James Marks, Rocky Mountain Laboratory, Hamilton, Montana.
1946 Britt, Henry Grady, Dept. of Biology, Wake Forest College, Box 125, Wake Forest, North Carolina.
1938 Brooke, Marion M., U. S. Public Health Service, 291 Peachtree Street, Atlanta, Georgia.
1946 Brookman, Bernard, 1841 Quincy St., Bakersfield, California.
1950 Brooks, Charles P., Dept. Trop. Med., Tulane U. Med. Sch., New Orleans 12, Louisiana.
*Brooks, Frank G., Cornell College, Mount Vernon, Iowa.
1947 Brooks, Thomas Joseph, 236 E. 6th Avenue, Tallahassee, Florida.
*Brown, Harold W., Columbia University School of Public Health, 600 West 168th Street, New York 32, New York.
1949 Brown, Virginius E., Biology Department, Marquette University, Milwaukee, Wisconsin.
1928 Browne, Patrick, 250 Bellevue Avenue, Trenton, New Jersey.
1950 Bullock, Wilbur L., Zoology Department, University of New Hampshire, Durham, New Hampshire.
1944 Burrows, Robert B., Tropical Research Med. Lab., APO 851, c/o Postmaster, New York, New York.
1950 Butler, Joseph Miles, 1045 Lake Street, Salt Lake City 4, Utah.
1945 Butts, Donald C. A., 3800 S. W. 58 Court, Miami 34, Florida.
1950 Bynum, Patricia, Biology Department, Fort Hays Kansas State College, Hays, Kansas.
1934 Byrd, Elon E., Dept. of Zoology, University of Georgia, Athens, Ga.

1935 Caballero, y Caballero, Eduardo, Apartado Postal #692, Mexico, D. F., Mexico.
1933 Cable, Raymond M., Dept. of Biological Sciences, Purdue University, W. Lafayette, Indiana.
1950 Callender, Maurice E., Lilly Research Laboratories, Eli Lilly & Co., Indianapolis, Indiana.
1935 Cameron, John A., Baylor University, College of Dentistry, College and Gaston Avenues, Dallas, Texas.
1932 Cameron, Thomas W. M., Macdonald College, Quebec, Canada.
1948 Camin, Joseph H., Entomology-Zoology Department, South Dakota State College, Brookings, South Dakota.
1950 Campbell, Charles H., 407 McCauley Street, Chapel Hill, North Carolina.
1941 Cantrell, William F., University of Louisville School of Medicine, 101 W. Chestnut St., Louisville 2, Kentucky.
1944 Cardenas Montero, Manuel Alfredo, 530 Monjitas Street, Santiago, Chile.
1940 Case, Arthur A., Veterinary Hospital, School of Veterinary Medicine, University of Missouri, Columbia, Missouri.
1945 Casis-Sacre, Guillermo, Goethe 18, Col. Anzures, Mexico, D. F.
1950 Cassady, Melvin A., A. P. Mission, New Palace Post Office, Kolhapur, India.

* Charter Members.

1944 CASTILLO, ROBERTO LEVI, P. O. Box 3606, Guayaquil, Ecuador, S. A.
1929 CAUSEY, OTTIS R., Caixa Postal 49, Rio de Janeiro, Brazil.
1931 CAUTHEN, GEORGE E., Texas Agricultural Experiment Station, Angleton, Texas.
1947 CHAMBERLAIN, ROY WILLIAM, U.S.P.H.S., C.D.C., Virus Lab., Route 3, Box 436, Federal Drive, Montgomery, Alabama.
1950 CHAN, KAM-FAI, Dept. Parasit., School of Public Health, 600 W. 168th St., New York 32, New York.
*CHANDLER, ASA C., Department of Biology, Rice Institute, Houston, Texas.
1945 CHAPMAN, J. W., Walterboro, South Carolina.
1945 CHAUHAN, B. S., Zool. Survey of India, 34 Chitteranjan Avenue, Calcutta 12, India.
1947 CHEATUM, E. L., Bureau of Wildlife Investigation, New York State Conservation Department, Delmar, New York.
1949 CHEN, HSIN TAO, (address unknown).
1944 CHEN, SUI-FONG, 4529 Middleton Lane, Bethesda, Maryland.
1948 CHERNIN, ELI, Dept. of Trop. P. H., Harvard School of P. H., 55 Shattuck St., Boston, Massachusetts.
1945 CHERNOFF, HARRY A., 584 Linwood Ave., Buffalo 9, New York.
1947 CHIANG, TZE SHENG, (address unknown).
1947 CHIN, TA-HSIUNG, (Kweiyang National Medical College, Kweiyang, China?).
1931 CHITWOOD, B. G., Dept. of Biology, Catholic University of America, Washington, D. C.
1948 CHOQUETTE, LAURENT P. E., Institute of Parasitology, Macdonald College, Quebec, Canada.
1949 CHOW, C. Y., Dept. of Zoology, National Taiwan University, Taipeh, Taiwan, China.
*CHRISTIE, JESSE R., Central Florida Experiment Station, Sanford, Florida.
1939 CHURCHILL, HELEN, Hollins College, Virginia.
1950 CHUTE, ROBERT M., Dept. of Parasitology, School of Hygiene & Public Health, 615 N. Wolfe St., Baltimore 5, Maryland.
1949 CIORDIA, HONORICO, University of Tennessee, Dept. of Zoology and Entomology, Knoxville, Tennessee.
1949 CLARK, DAVID T., 1500 G. Street, Lincoln, Nebraska.
*CLARK, HERBERT C., Gorgas Memorial Laboratory, Apartado 1252, Panama, Republic de Panama.
1949 CLOYD, WILL J., P. O. Box 4258, University Station, Knoxville, Tennessee.
1926 COATNEY, G. ROBERT, Division of Physiology, National Institutes of Health, Bethesda, Maryland.
1945 COFFIN, DAVID L., Angell Memorial Hospital, 180 Longwood Avenue, Boston 15, Massachusetts.
1950 COIL, WILLIAM H., Stone Institute, Put-in-Bay, Ohio.
1950 COKER, GRADY N., JR., 846 Heard Ave., Augusta, Georgia.
1950 COLE, BERWIN A., Dept. of Parasitology, A.M.D.R. & G.S., Army Medical Center, Washington 12, D. C.
1950 COLEMAN, RICHARD W., Div. of Entomology & Parasitology, University of California, Berkeley, California.
1949 COLGLAZIER, MERLE L., 5610 Hamilton Manor Drive, Apt. 1, Hyattsville, Maryland.
1949 COMROE, DANIEL B., U.S.A.F. S.A.M., Randolph Field, San Antonio, Texas.
1941 CONNELL, FRANK H., (address unknown).
1951 CONNER, PHYLLIS, 6945 S. Crandon, Chicago, Illinois.
1950 CONNOR, ROBERT S., 919 Walnut Lane, E. Lansing, Michigan.
1947 CONRAD, HELEN EDITH, Dept. of Zoology, Oklahoma A. & M. College, Stillwater, Oklahoma.
1950 CONTACOS, PETER G., Dept. of Tropical Medicine, Tulane Univ. School of Medicine, New Orleans 12, Louisiana.
1944 CORIA, NICHOLAS A., Rockefeller Institute, Princeton, New Jersey.
1946 CORPRON, RUTH ALEXANDRA, Baton Rouge General Hospital, Baton Rouge, Louisiana.
*CORT, WILLIAM W., Dept. of Parasitology, School of Hygiene & P. H., Johns Hopkins University, Baltimore 5, Maryland.
1940 COULSTON, FREDERICK, Institute of Medical Research, Christ Hospital, Cincinnati 19, Ohio.
*COVENTRY, FRANCES A., 158 Wilson Drive, Lancaster, Pennsylvania.
1949 COX, HERBERT W., Box 1111, Chapel Hill, North Carolina.
1951 CRAIG, WILLIAM H., 903 West 35th Street, Los Angeles 7, California.
*CRAM, ELOISE B., Laboratory of Tropical Diseases, N.I.H., Bethesda 14, Maryland.
1935 CRAWFORD, WILEY W., (address unknown).

* Charter Members.

1944 Cross, Joy Barnes, Dept. of Preventive Medicine, University of Texas Medical School, Galveston, Texas.
1948 Crowcroft, Peter, Bureau of Animal Population, Dept. Zool. Field Studies, 91 Banbury Road, Oxford, England.
1947 Crowell, Robert Merrill, Dept. of Biology, College of Wooster, Wooster, Ohio.
1948 Crystal, Maxwell, M., 2321 Dwight Way, Berkeley 4, California.
1937 Cuckler, Ashton C., Merck Institute for Therapeutic Research, Rahway, New Jersey.
1935 Culbertson, James T., Division of Research Grants & Fellowships, National Institute of Health, Bethesda 14, Maryland.
1948 Cunliffe, Frederick, 7240 Ninth St., South St. Petersburg, Florida.
1948 Cunov, Harvey F., 2nd Bn. M.F.S.S., Ft. Sam Houston, Texas.

1942 Dalmat, Herbert T., Oficina Sanitaria Pan Americana, Apart. 383, Guatemala, Guatemala.
1949 Dalton, Russell R., Laboratory, U. S. Army Hospital, Camp Polk, Louisiana.
1928 Daniel, George E., Physical Biology, National Institutes of Health, Bethesda 14, Maryland.
1939 D'Antoni, Joseph S., 1825 Calhoun St., New Orleans 15, Louisiana.
1950 Daugherty, Jack W., Biology Department, The Rice Institute, Houston, Texas.
1944 Davis, Betty S., 1420 E. Mountain St., Pasadena, California.
1944 Davis, Gordon E., Rocky Mountain Laboratory, Hamilton, Montana.
1941 Davis, Leonard R., Regional Animal Disease Research Laboratory, U. S. Bureau of Animal Industry, Auburn, Alabama.
1938 DeGiusti, Dominic L., Dept. of Biology, Wayne University, Detroit 1, Michigan.
1939 Dehnbostel, Nellie G., 178 Iddings Avenue, N. E., Warren, Ohio.
1949 Delappe, Irving P., Dept. of Bacteriology and Public Health, Michigan State College, East Lansing, Michigan.
1940 Delaune, Elaine T., (address unknown).
1948 deLucena, Durval T., Laboratorio Regional do S.N.M., Rua da Palma 295, 2° andar, sala 212, Recife, Pernambuco, Brasil.
1938 Denton, J. Fred, Dept. of Bacteriology and Public Health, Georgia Medical School, Augusta, Georgia.
1934 Derbyshire, Russel C., University of Omaha, 60th and Dodge St., Omaha 1, Nebraska.
1949 Desowitz, Robert Schaen, London School of Hygiene and Tropical Medicine, Gower Street, London W. C. 1, England.
1939 DeTurk, William E., Dept. of Zoology, Vanderbilt University, Nashville, Tennessee.
1943 DeVolt, Harold Moon, Dept. of Pathology, University of Maryland, College Park, Maryland.
1950 DeWitt, William B., Laboratory of Tropical Diseases, National Institutes of Health, Bethesda, Maryland.
1947 Diamond, Louis Stanley, Patuxent Research Refuge, Laurel, Maryland.
1949 Dias, Emmanuel, Rua Prof. Estevão Pinto 175, Belo Horizonte, Minas Gerais, Brazil.
1931 Dickerman, Eugene E., Bowling Green State University, Bowling Green, Ohio.
1934 Dobrovolny, Charles G., Laboratory of Tropical Diseases, National Institutes of Health, Bethesda 14, Maryland.
1941 Doetschman, Willis H., 9 Ronada Avenue, Oakland 11, California.
1948 Dollfus, Robert Ph., Lab. d'Helminthologie coloniale et de Parasitologie Comparée, Museum National d'Histoire Naturelle, 57 Rue Cuvier, Paris 5, France.
1938 Donaldson, Alan W., 605 Volunteer Bldg., Atlanta 3, Georgia.
1949 Doss, Mildred A., Zoological Division, National Agric. Res. Center, Beltsville, Maryland.
1946 Dotterer, John E., 510 Gulf St., Sanford, North Carolina.
1942 Dougherty, Ellsworth C., Dept. of Medical Physics, University of California, Berkeley 4, California.
1946 Douglas, James Russell, School of Veterinary Medicine, University of California, Davis, California.
*Dove, Walter E., Defense Highway, Gambrills, Maryland.
1950 Dowell, Frank H., Dept. of Zool.-Entomology, University of Tennessee, Knoxville, Tennessee.
1941 Downs, Wilbur G., Calle Londres 45, Mexico D.F., Mexico.
1947 Drobeck, Mrs. Hans P., 102 Wichell Rd., University Heights, Syracuse, New York.
1950 Dropkin, Victor H., Roosevelt College, 430 S. Michigan Avenue, Chicago 5, Illinois.
1950 Drudge, J. H., Dept. of Animal Path., Univ. of Kentucky, Lexington 29, Kentucky.

* Charter Members.

1945 DUFF, FRATIS L., ROTC Detachment, Johns Hopkins Medical School, Baltimore, Maryland.
1946 DUNLAP, JACK SHERWIN, College of Veterinary Medicine, State College of Washington, Pullman, Washington.
1947 DUNN, MARY CATHERINE, 8655 E. Jefferson, Detroit, Michigan.
1949 DURBIN, CHARLES G., 5705 Berwyn Rd., Berwyn Heights, Maryland.

1946 EADS, RICHARD B., Texas State Dept. of Health, Austin 2, Texas.
1941 EARLE, HILTON H., JR., Sixth Army Area Med. Lab., Fort Baker, California.
1946 EDELMAN, MORTON HENRY, 129 E. 79th St., New York 21, New York.
1940 EDGAR, S. ALLEN, Poultry Department, Alabama Polytechnic Institute, Auburn, Alabama.
1950 EHRENFORD, FRANK A., School of Veterinary Medicine, University of California College of Agriculture, Davis, California.
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